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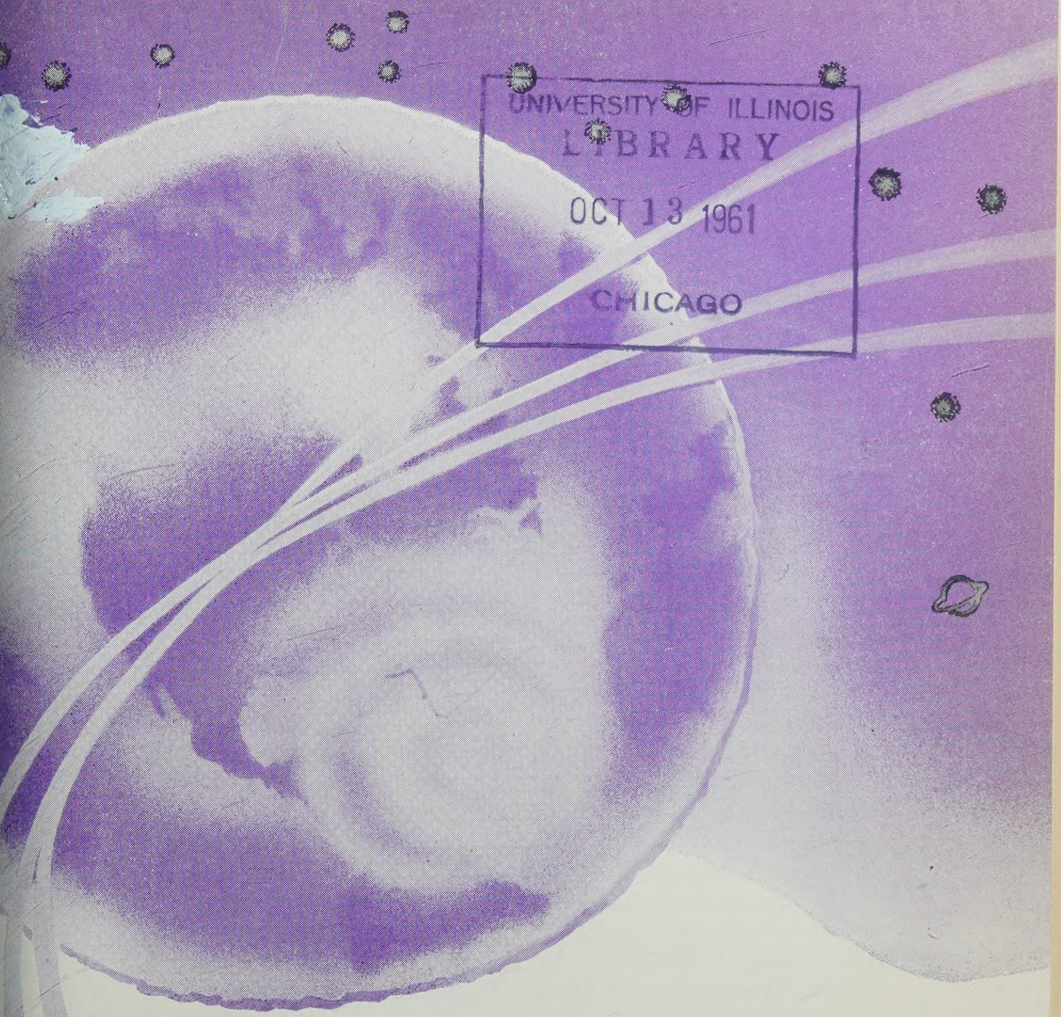

Meteorological & Geoastrophysical ABSTRACTS

Vol. 12 JUNE 1961 NO. 6

METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS

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METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS

MALCOLM RIGBY, Editor

Vol. 12 June 1961 No. 6

AGRICULTURE · COMMERCE · AERIAL AND MARINE NAVIGATION · PUBLIC HEALTH · INDUSTRY · ENGINEERING
AMERICAN METEOROLOGICAL SOCIETY
1919

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Special Feature in This Issue

Annotated Bibliography on Upper Atmosphere Structure Above 300 km

By

Elemer Kiss

(For complete table of contents see back cover)

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FOREWORD

Meteorological and Geoastrophysical Abstracts is a monthly publication devoted to current literature in meteorology, geophysics and astrophysics.

Part I contains abstracts of current literature in the fields of meteorology, etc.

Part II of each issue comprises an annotated bibliography of important references on a special subject. Bibliographies published in the successive issues were:

Vol. I, 1950

1. Atmos. Pollution 2. Aerobiology 3. Cloud Physics 4. Hail
5. Tornadoes 6. Volcanic Dust 7. Climat. Changes 8. Thunderstorms
9. Icing 10. Acoust. Propagation 11. Evaporation

Vol. II, 1951

1. Extended Forecast. 2. Long Range Forecast. 3. Soil Temp. 4. Constants, etc.
5. Clim. of Near East 6. Clim. of Middle East 7. Special Winds 8. Radar Storm
9. Condensation Trails 10. Clim. of N. E. Africa 11. Mountain Met. Detect.

Vol. III, 1952

1. Clim. of N. W. Africa 2. Carbon Dioxide 3. Clim. of Argentina, etc. 4. Dew
5. Objective Forecast. 6. Stratus Forecast. 7. Urban Climatology 8. Clim. of C. Africa
9. Visibility 10. Glaze and Rime 11. Free Air Turbulence

Vol. IV, 1953

1. Turbulence Theory 2. Turbulent Diffusion 3. Frost 4. Clim. of Australia, etc.
5. High Level Winds 6. Winds in Stratosphere 7. Jet Stream 8. Radiation Bioclim.
9. Clim. of Pacific 10. Auroras 11. Sferics

Vol. V. 1954

1. Oceanog. Met. 2. Clim. of S. E. Asia 3. Auroral Physics 4. Tropopause
5. Balloons 6. Numerical Forecast. 7. Radiation Data 8. Vertical Motion
9. Clim. of Arctic 10. Industrial Met. 11. Wind Waves and Swell

Vol. VI, 1955

1. Bibliog. of Bibliog. 2. Texts & Monogr. Bibliogs. 3. Storm Surges
4. Ionospheric Prop. 5. Photochem.—Upper Atmos. 6. Cloud Physics
7. Radar Cloud Physics 8–9. Atmos. Nuclei 10. Weather Modification 11. Cooling Power

Vol. VII, 1956

1. Synoptic Met.-Arctic 2. Clim. of Enclosed Spaces 3. Cosmic Rays (–1952)
4. Cosmic Rays (1953–56) 5. Atmos. Radioactivity 6. Inversions
7. Snow Micromet. 8. Snow Micromet. (Suppl.) 9–11. Tropical Cyclones

Vol. VIII, 1957

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4. Forest Micrometeorology 5. Hydromet. Forecasting 6. Numerical Forecast. (Suppl.)
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Vol. IX, 1958

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4. Waves and Currents 5. Physical Oceanog. 6. Dynamic & Phys. Oceanog.
7. Long Range Forecast. 8. Radar Met. 9. Cosmic Rays 10–11. Geomagnetism

Vol. X, 1959

1. Works of C. E. P. Brooks 2. Tornado Forecasting 3. Soil Moisture 4. Sferics
5–6. Ozone 7. Acoustic Waves 8. Evaporation Measurement
9. Evapotranspiration (–1955) 10. Evapotranspiration (1956–1959) 11. Evaporation

Vol. XI, 1960

1. Outstanding Reference Works 2. Outstanding Texts 3. Numerical Forecast. (Suppl.)
4. Ionospheric Physics 5. Ionospheric Propagation 6. Ionosphere
7. Forecast Verification 8. Radar Meteorology 9. Rocket Meteorology
10. Satellite Meteorology 11. Airglow

Bibliographies in preparation or published in Vol. XII

Aurora (No. 1)
Auroral Physics (No. 2)
Limnology (No. 3)
Upper Atmosphere Structure (No. 4, 5 and 6)
Precipitation Chemistry (No. 7)
Upper Atmos. Humidity

Part III contains a listing of reviews, translations, reprints, and the contents of important publications. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where t material may be found. The Union List of Serials (Gregory) is the source of most of t symbols used. In some cases, where no symbol has been assigned to a library, one will devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DNLM:	U. S. National Library of Medicine, Washington, D. C.
DSI:	Smithsonian Institution, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by char

Geographic locations are in the English form rather than the form used locally, for examp Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwi stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet using a modific tion of the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months a abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Numb (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus entry will read as follows:

Meteorologische Rundschau, 2(5/6):146–151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau*, *Jahrgang* 2 (V 2), *Heft* 5/6 (No. 5/6), *pages* 146–151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL WORKS

A. GENERAL

A1. COLLECTED WORKS

See also: **First Continental Expedition, 1955–1957, Antarctica,** 12.6–61.

12.6–1 523.164:016.3 621.396.8:061.3

Menzel, Donald Howard (*ed.*), **The radio noise spectrum.** Cambridge, Mass., Harvard University Press, **1960.** Price: $7.50. 183 p. figs., tables, refs., eqs. Contents (these articles abstracted separately): Allen, E. W., **Man-made radio noise,** p. 1–6. Peterson, Allen M., **The aurora and radio wave propagation,** p. 7–42. Lawrence, Robert S., **Ionospheric scintillation of radio waves of extraterrestrial origin,** p. 43–47. Eshleman, Von R., **Meteor scatter,** p. 49–78. Hawkins, Gerald S., **Electromagnetic emission from meteors,** p. 79–92, Helliwell, R. A., **Whistler-mode propagation,** p. 93–100. Maxwell, A.; Swarup, G. and Thompson, A. R., **Radio spectrum of solar activity,** p. 101–110. Aarons, Jules, **Natural background noise at very low frequencies,** p. 111–122. Gold, Thomas and Menzel, Donald H., **Solar whistlers,** p. 123–128. Burke, B. F., **Noise of planetary origin,** p. 129–140. Bracewell, R. N., **Correcting noise maps for beamwidth,** p. 141–150. Menzel, Donald H., **Study on cosmic radio noise sources,** p. 151–176. Gold, Thomas, **Interstellar hydrogen,** p. 177–179. **DWB** (621.38411 M551ra), **DLC**—The individual chapters of this book consist of papers presented by the respective authors at the Conference on Radio Noise held at Harvard College Observatory, April 22, 1958. The studies deal with problems of radio noise, its source, whether man-made or natural, over the known range of frequencies as well as the origins and significance of certain characteristic noise radiations. Following the presentation of each paper discussions were held and pertinent parts of the discussion are appended to the papers. *Subject Headings:* **1. Radio astronomy conferences 2. Ionospheric radio wave scintillation 3. Radio noise spectrum 4. Planetary radio noise sources.**—*E.Z.S.* Ⓢ

12.6–2 551.46:061.3

Pacific Science Congress, 9th, Bangkok, Nov. 18–Dec. 9, 1957, **Proceedings, Vol. 16, Oceanography.** Sponsored by His Majesty's Government of Thailand and The Science Society of Thailand. Pub. by the Secretariat, 9th Pacific Science Congress, by Dept. of Science, Bangkok, Thailand, **1958.** 240 p. figs., tables, refs., eqs. (For listing of pertinent complete papers, *see* 12(6):1265, June 1961, *Met. Abs.* These articles abstracted separately.) **DWB** (M(06) P117p)—The Congress was held at Chulalongkorn University, Bangkok, Thailand. This volume contains a list of participants, reports of standing committees and a collection of papers, some in abstract and some in complete form which were presented at the Congress. The oceanography section of the Congress was arranged in separate symposia dealing with: the physical, chemical and biological aspects of upwelling; the oceanography and marine resources of the Gulf of Thailand; the disposal of radioactive wastes; physical, chemical and biological oceanography; reports on Operation Equapac and on techniques of ocean productivity. *Subject Headings:* **1. Oceanographic conferences 2. Oceanographic symposia.**—*E.Z.S.*

12.6–3 551.510.536(08)

National Research Council, Wash., D. C. U. S. National Committee on the International Scientific Radio Union (URSI), **Symposium of the Exosphere and Upper F Region, May 4, 1960, National Bureau of Standards, Wash., D. C.** *Journal of Geophysical Research*, Wash.,

D. C., 65(9):2563–2636, Sept. **1960.** (Summaries of papers, or full manuscript in case papers to be published in near future. For listing of all papers abstracted separately, s 11(11):1884, Nov. 1960, *Met. Abs.*) **DWB**—A report of the proceedings of the Symposium presented. The contributions fall into the following four categories: general feature of t exosphere and upper F region; electron densities in and above the F region as revealed b magnetoionic refractive effects imposed on radio emissions from rockets and artificial satellite integrated electron content derived from refractive effects; electron-ion densities and tem peratures derived from incoherent backscatter. Papers from these four groups with th corresponding discussions are summarized in a fifth section. *Subject Headings:* **1. Exospher symposia 2. Upper F region.**—*O.T.*

12.6–4 551.511:551.513(061.3

Pfeffer, Richard L. (*ed.*), **Dynamics of climate: the Proceedings of a Conference on th Application of Numerical Integration Techniques to the Problem of the General Circulation held Oct. 26–28, 1955.** Sponsored jointly by Institute for Advanced Study, Princeton, N. J and Geophysics Research Directorate, Air Force Cambridge Research Center, Air Researc and Development Command. N. Y., Pergamon Press, **1960.** 136 p. figs., photos, refs eqs. (For listing of papers abstracted separately, *see* 11(10):1740, Oct. 1960, *Met. Abs.* Price: $6.50. **DWB, DLC.** Review by E. T. Eady in *Science Progress*, London, 49(193):131 135, Jan. **1961.**—The summary of the proceedings of the conference at the Institute for Ad vanced Study, Princeton, N. J. on dynamical mechanism of the general circulation is presented Based on observations since World War II, studies revealed the consistency of the atmospher with fundamental principles of momentum and energy conservation. Laboratory experiment simulated atmospheric conditions in a cylindrical or spherical vessel of fluid under suitabl conditions of heating and rotation. They show where the atmospheric circulation fits int the scheme of convective motions generated by heating and rotation. Theoretical investiga tions aimed to solve the differential equations governing models of the atmospheric circulation The Institute of Advanced Study high-speed electronic computer was used to integrate th equations governing the idealized motions of the model-atmosphere. The results of th conference include papers on numerical methods; on studies of the general circulation an climatic change; and on the subject of radiative transfer. Editors summary of their discussions is contained in the final section. *Subject Headings:* **1. Atmospheric circulation dynamics 2. Numerical integration techniques.**—*O.T.*

12.6–5 551.510.721

†U. S. Congress. Joint Committee on Atomic Energy, **Fallout from nuclear weapons tests. Hearings before the Special Subcommittee on Radiation, 86th Congress, First Session, May 5, 6, 7, and 8, 1959.** Wash., D. C., Govt. Print. Off., **1959.** 3 Vol. 2618 p. figs., tables, bibliogs. throughout; general bibliog. p. 2578–2618. Also **Summary-analysis of the hearings,** issued Wash., D. C., Aug. 1959. 42 p. charts, tables. Review in *Science*, Wash., D. C., 130(3376):612–614, Sept. 11, **1959.**—Once again the best information available on radioactive fallout and its effects is being presented in all detail of fact and interpretation. Another report of similar scope was published on the 1957 Congressional hearings (*see* 9C–166, March 1958, *Met. Abs.*), covering all scientific information which could be obtained at that time. The purpose of the 1959 hearings was to bring up to date the earlier information, to examine some new aspects of the problem, to consider possible policies to be adopted and to learn what is being done in research and monitoring of fallout. One of the aims of the hearings was to gather together a maximum amount of valuable scientific information on fallout, as no other mechanism exists for the fulfillment of this important function. The three large volumes (like the 1957 report) contain a variety of forms of information, including prepared statements, transcripts of cross-examinations of witnesses, round-table discussions, special reports by witnesses and other experts, reprints of published papers, bibliographies, etc. Some of the problems which the hearings were to clarify are: 1) basic distinctions such as local vs. worldwide fallout, monitoring surveillance vs. research, population vs. individual risk and relationship of fallout distribution to different types of fallout models; 2) changes in worldwide fallout since 1957; 3) developments in understanding of fallout mechanisms; 4) forecasts of future fallout levels; 5) developments in understanding the biological effects of radiation; 6) estimating and

forecasting of biological hazard; 7) existing radiation protection standards; 8) "hot spots"; 9) government organization and 10) data collection. As is unavoidable in a publication of this type, the vast amount of material is somewhat loosely organized, leaving much to the reader in locating the pages where discussions or data on particular subjects may be found. The subject index, planned as Vol. 4 of the report, will undoubtedly contribute a great deal toward rendering much of the valuable information more readily accessible. Data and discussions of meteorological interest are interspersed throughout the three volumes, in statements, comments, discussions and papers by L. MACHTA (U. S. Weather Bureau), W. E. LIBBY (AEC), M. EISENBUD (AEC), L. B. LOCKHART (Naval Res. Lab.), W. LANGHAM (Los Alamos Scientific Lab.) and many others. In the **Summary-Analysis** the major points emerging from the hearings are stated in concise form under the headings of origin of fallout; distribution (nonuniform distribution has been confirmed); uptake of radioactive isotopes; biological effects of radiation; hotspots and their significance; significance of short-lived isotopes (may merit greater attention than received in the past); significance of C-14 ("could constitute a genetic hazard to the world's population"); maximum permissible dose and concentration; effects of past and future tests; alternative patterns of testing; and government program and organization. *Subject Headings:* **1. Congressional hearings on radioactive fallout 2. Radioactive fallout.** —*G.T.*

12.6–6 551.510.42:061.3(08)

*†National Society for Clean Air, London, **Proceedings of the Diamond Jubilee International Clean Air Conference,** London, Oct. 20–23, 1959. Pub. by the Society, **1960.** 290 p. figs., photos, tables, refs. Price: 32 sh. Articles of interest (abstracted separately) are: Besson, — and Pelletier, J.: **Atmospheric pollution in the Paris area,** p. 122–129. Cummings, W. G. and Redfearn, M. W.: **The measurement of sulphur dioxide in the atmosphere near power stations,** p. 130–132. Giovanardi, A.; Grosso, E. and De Fraja Frangipane, E.: **Researches on the atmospheric pollution of the city of Milan,** p. 133–134. Halliday, E. C.: **Research on air pollution in South Africa,** p. 137–138. Kirste, H.: **Dust measurements to determine the sources of emissions damaging crops,** p. 154–156. Lucas, D. H.: **The calculation of sulphur dioxide and smoke concentration from domestic sources in cities,** p. 157–159. Paccagnella, B.: **The investigation of air pollution in Padua during the years 1955–'58,** p. 167–171. Petrilli, Fernando Luigi: **Air pollution in the city of Genoa (Italy),** p. 172–174. Schwarz, K.; Gilbert, T. and Ratzki, E.: **Research into atmospheric pollution in the city of Essen,** p. 177–180. Meade, P. J.: **Inversions and air pollution,** p. 207–208. Scorer, R. S.: **The photography of air pollution,** p. 228–233. Spurr, G.: **The penetration of inversions by hot plumes,** p. 234–235. Waller, R. E. and Commins, B. T.: **Air pollution in the city of London,** p. 236–238. 69 papers are listed in its **Sixty years for clean air.** London, **1959.** 56 p.—This conference was convened by the National Society for Clean Air to celebrate its Diamond Jubilee. The conference was divided into five sessions. The first session consisted of the preliminaries and an opening address by SIR GRAHAM SUTTON. The other sessions were held under the titles —— National air pollution problems, legislation, education, etc.; III—Technical; IV—Observations, investigations and measurement of air pollution; V—Research and international cooperation. About 20 papers were presented at each session. These are reproduced in full in this volume. The papers themselves were not actually read at the conference but at the beginning of each session a rapporteur read a review of the papers presented and a discussion ensued including replies by authors to any points raised. The sessional reviews and reports of the discussions are also included in this book. *Subject Heading:* **1. Air pollution conferences.**—*R.B.*

12.6–7 551.510.53(08):613.693:629.19

†International Symposium on the Physics and Medicine of the Atmosphere and Space, San Antonio, Texas, Nov. 10–12, 1958. 2nd, **Physics and Medicine of the Atmosphere and Space: Proceedings of the 2nd Symposium.** Ed. by Otis O. Benson, Jr. and Hubertus Strughold. Arranged by Southwest Research Institute, San Antonio, Texas. New York, John Wiley, **1960.** 645 p. figs., tables, refs. at end of each ch. (For listing of pertinent articles, abstracted separately, *see* 12(5):1043, May 1961, *Met. Abs.*) **DLC, DWB** (M86:612 161 ph)—The forty-two papers read at this second symposium on upper atmosphere physics are included in this volume. Physical scientists and engineers were brought together with bioscientists, in order to assemble all of the data pertinent to manned space flight. The natural radiations

of space were a major subject of discussion, and laboratory simulation was of paramou interest. The question of vehicles for space exploration was a popular subject. Pertine medical observations bearing on space flight were presented. *Subject Headings:* **1. Upp atmosphere physics symposia 2. Space medicine symposia.**—*E.Z.S.*

12.6–8 526:061

Conference on Contemporary Geodesy, Cambridge, Mass., Dec. 1–2, 1958, **Contempora geodesy: proceedings of a conference held at the Harvard College Observatory—Smithsonia Astrophysical Observatory, Cambridge, Mass., Dec. 1–2, 1958.** Conducted under the joi sponsorship of the two Observatories and the American Geophysical Union. Ed. by Charl A. Whitten and Kenneth H. Drummond. *American Geophysical Union, Geophysical Mon graph*, No. 4, **1959.** 95 p. figs., tables, refs., eqs. (*National Research Council, Wash., D. C Publication*, No. 78.) (For listing of papers of this conference, abstracted separately, s 11(9):1540, Sept. 1960, *Met. Abs.*) **DWB, DLC** (QB275.C64 1948)—Proceedings of th conference held at the Harvard College Observatory-Smithsonian Astrophysical Observatory Cambridge, Mass. Dec. 1–2, 1958. The purpose of the conference was not merely to orien other scientists in modern geodesy but just as important to enlighten the geodesist in thos sciences required in space application to his problem. Three sections were held: Geodeti fundamentals—concepts and techniques and some aspects of Physical Geodesy were discusse Present day problems in geodetic astronomy, triangulation, leveling, gravity and studies of th geoid were considered in the second section. The third section considered Geodesy and space Discussion to see whether the artificial satellite is indeed unique in its properties to determin geodetic quantities. Each presentation was followed by stimulating and profitable exchang in the panel discussion. The appendix contains a list of the participants. Abstracts of th papers appear. *Subject Headings:* **1. Geodesy conferences 2. Geodetic theory 3. Geodes and space 4. Geodetic astronomy. I. Whitten, Charles A.** (*ed.*) **II. Drummond, Kenneth, H** (*ed.*).—*E.Z.S.*

A2. TEXTBOOKS AND BOOKS

See also: **Met. instruments and measurements** (Stružka), 12.6–18; **First Continental Expedition, 1955–1957,** 12.6–61; **Antarctic world** (Euller), 12.6–62.

12.6–9 551.482:551.579.1(47)

*†Andreianov, V. G., **Vnutrigodovoe raspredelenie rechnogo stoka.** [Yearly stream runoff distribution.] Leningrad, Gidrometeoizdat, **1960.** 327 p. 66 figs. (4 fold.), 58 tables, bibliog. p. 320–327. numerous eqs. At head of t-p.: Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby pri Sovete Ministrov SSSR, Gosudarstvennyĭ Ordena Trudovogo Krasnogo Znameni Gidrologicheskiĭ Institut. **DWB** (551.48 A559vn)—A large handbook or textbook, presenting in great detail, the empirical, physical (theoretical) and geographical material necessary for analysis and computation of the water and heat balance of river basins in different seasons. It is based on formulas for the seasonal (monthly) river regime as influenced by physiogeographic factors. The 26 chapters are divided into five main sections: I. Investigations and development of formulas for seasonal runoff regime; II. Research into the "Calendar" wise distribution of seasonal runoff and methods of calculation; III. Characteristics of seasonal distribution of amount of runoff and application to hydrological computation; IV. Curves of duration of runoff and their use in hydrologic and conservation engineering; V. Methods of calculating seasonal runoff regulation factors on above basis. Graphical and statistical examples and useful nomograms are given in great profusion. Evaporation, transpiration, percolation, soil moisture and temperature and other factors affecting the water balance in forests, fields and bare ground are included in the calculations and discussion of the seasonal changes in runoff and their use in regulating water supply and flow. Actual parameters used in calculations are given for 40 stations and summarized for 20 basins in the U.S.S.R. Some of the factors are shown on charts of the European U.S.S.R. *Subject Headings:* **1. River runoff calculations 2. River regulation 3. Seasonal runoff variations 4. Runoff in U.S.S.R. 5. European U.S.S.R. I. Sokolovskiĭ, D. L.** (*ed.*).—*M.R.*

12.6–10 551.594.22(02):016

†Viemeister, Peter E., **The lightning book.** With diagrams by Read Viemeister. Garden City, N. Y., Doubleday, **1961.** 316 p. 71 figs., 53 plates (mostly photos), bibliog. p. 295–307. Price: $4.50. **DLC**—A readable and informative book on all aspects of lightning—its origin, nature, effects and protection against, or avoidance of, its damaging effects. The first part (Ch. 1–3) has to do with lightning through the ages, the work of FRANKLIN and recent lightning research. Pt. II (Ch. 4–8) deals with the physics—origin and development of thunderclouds, climatology, meteorology, radar and sferics detection and forecasting, importance to man, the atmospheric electrical mechanism of the discharge, ball lightning and acoustical effects. Pt. III (Lightning in action) contains 11 chapters covering terrestrial effects, photography, effects on forests and trees, farm problems (fences, fertilizer, etc.), hazards to man in open and in motion, in ships or boats, aircraft, pranks played by lightning, unsolved problems and brief rules for protection. A good list of references (by chapters), and a thorough index appear at the end. A very nice group of photographs appear as plates and a number of sketches, etc., illustrate the history and processes, effects, etc., while not strictly a textbook, this excellent systematic and thorough treatment of an important subject in meteorology could be used for text or reference purposes in Junior and Senior high schools and general college courses. *Subject Headings:* **1. Lightning textbooks 2. Lightning protection 3. Lightning bibliography.** —*M.R.*

12.6–11 551.579(02)

*†Luchsheva, A. A., **Prakticheskaia gidrologiia; uprazhneniia po gidrologicheskim raschetam.** [Practical hydrology; exercises in hydrologic calculations.] 2d ed. rev. & enl. Leningrad, Gidrometeoizdat, **1959.** 467 p. 113 figs. (8 fold.), 197 tables, 25 charts, 51 refs., 295 eqs. (For abstract on 1st. ed., **1950,** *see* 4.10–216, Oct. 1953, *Met. Abs.*) **DWB** (M79 L936pr) —In revising and enlarging this practical text on hydrology, the author has preserved the 13 chapters and appendix, and even the 54 sub-chapters with no changes except in a few cases in the wording of the chapter heading (e.g., Ch. 6, **Climatic characteristics of basins** has been changed to **Hydrometeorological characteristics of basins,** and Ch. 7, **Normal runoff** to **Mean long-period runoff**). However, the revision has been much more extensive than the cursory examination of chapter headings would indicate, for the 271 pages of text and 20 pages of supplementary tables have been expanded to 419 pages of text and 48 pages of appendix. The number of tables in the appendix has been doubled (from 13 to 25) and in the text increased from 125 to 197, while the illustrations have been increased from 70 to 113 and the equations from 164 to 295. Moreover, the number of actual applications of the theory or methods has been increased tremendously throughout the book; numerous large folded charts showing hydrological quantities either computed or observed are included. The subject outline is fairly standard: 1) General; 2) Hydrographic character of rivers and their basins; 3) River level and runoff regime—ice phenomena; 4) Calculation of current velocity, runoff and power of rivers; 5) Correlation in runoff calculations; 6) Hydrometeorology of river basins (precipitation, water supply in snow cover, saturation deficit, evaporation from water surfaces and from soil); 7) Average long period runoff; 8) Variations in annual runoff; 9) Seasonal variation; 10) Flood or maximum runoff; 11) Minimum or low water; 12) Sediment in runoff; 13) Characteristics of lakes and reservoirs (water balance, wind waves; temperature curves, etc.). Appended are 25 extensive tables for calculating runoff, hydrographs, statistical confidence factors, etc. The 51 references to material through 1957 are entirely to Russian sources. One table (p. 457–461) gives for one or more points on every major and minor river basin (arranged by regions) the coordinates, area of watershed, the percentage of the basin which is lake, bog or forest. Similar empirical data are found in tables and maps throughout. In fact, the whole text consists of practical examples of calculations of the various factors, with all of the necessary aids for calculation included. *Subject Headings:* **1. Hydrology textbooks 2. Hydrology of U.S.S.R. 3. Hydrology of lakes.**—*M.R.*

12.6–12 533.6(02) 532.52

†Arzhanikov, N. S. and Mal'tsev, V. N., **Aerodinamika.** [Aerodynamics.] Moscow, Gos. Izd-Vo Oboronnoĭ Promyshlennosti, **1956.** 483 p. 19+ figs., 19 tables, 85 refs., 19+ eqs. **DLC** (QA930.A7 1956) —A standard textbook on theoretical aerodynamics for students

in advanced courses at aeronautics schools, for engineers and technical workers in aviatic and construction. The 19 chapters are divided into two general parts. A. Theory of aer dynamics of incompressible flow; and B. Gas dynamics. Chapters in the first section are entitle I. History of hydroaerodynamics (foreign, Russian and Soviet); II. Basic concepts; III. Kin matics; IV. Hydrodynamics of ideal fluids; V. Theory of vorticity; VI. Theory of comple transforms and applications to hydrodynamics; VII. Theory of wings in a uniform flov VIII. Jet and vortical flow theory; IX. Movement of viscous fluids; X. Boundary lay theory. The last 9 chapters deal with the particular application of gas dynamics to aer dynamic problems. *Subject Headings:* **1. Aerodynamics textbooks 2. Hydrodynamic theorie** —*M.R.*

12.6–13 550.312(02

Liustikh, E. N., **Isostasy and isostatic hypotheses, by E. N. Lyustikh.** *Soviet Researc in Geophysics* (issued American Geophysical Union), Vol. 2, **1960.** 119 p. 33 figs. (son fold. in pocket), 4 tables, 69 refs., 46 eqs. **DLC, DWB**—Transl. by Consultants Bureau N. Y. of original Russian **Izostaziia i izostaticheskie gipotezy,** issued as *Akademiia Nauk SSSR Geofizicheskiĭ Institut, Trudy,* No. 38(165), **1957. DLC**—A review and discussion of th principles of isostatic theory and the hypotheses of isostasy. The chapter headings ar indicative of the scope of the book: principles of isostatic theory; method of studying isostasy influence of geologic processes on isostasy; isostatic hypotheses; the isostatic status of the earth the causes of zonal anomalies; compensation and overcompensation; errors in the analysis o isostatic anomalies; the "emergence" of Fennoscandia; and the role of isostasy. The work o Airy, Pratt, Dutton, Lukashevich, Bowie, Heiskanen, Jeffrey, Venig-Meinesz Zhongolovich and others is considered and evaluated. It is pointed out that the map o Bouguer anomalies reflects the general distribution of compensating masses; and if the caus of free-air anomalies were an excess or deficiency in these masses the map of free-air anomalie would be in some measure similar to the map of Bouguer anomalies. But this is not so: th distribution of zonal free-air anomalies differs completely from the distribution either o topography or of Bouguer anomalies. It is equally impossible to detect any relationshi between zonal free-air anomalies and geotectonic, magnetic and seismic maps of the earth also fail to show any great similarity to the map of the free-air anomalies. These facts sugges that the cause of zonal free-air anomalies cannot be in the crust; it must be sought in the deepe shells of the earth. In addition the post glacial "emergence" of Fennoscandia is questioned The general conclusion of the study is that isostasy plays only a secondary role in the develop ment of the earth, though far from a negligible one. Isostatic forces are not generally the cause of tectonic movements, but are only a form of control; they either limit the amplitude or fix the level at which these movements die out. Maps of free-air anomalies and of Bouguer anomalies in western and eastern hemispheres are included. A few tables are included which contain significant data on gravity anomalies, coefficients of overcompensation in the sea and in East Africa. Some of the data summaries are presented in graphic form. *Subject Headings:* **1. Isostasy textbooks 2. Geotectonics 3. Geodynamics.**—*E.Z.S.*

12.6–14 551.579(02):378

*†Leivikov, Moiseĭ L'vovich, **Praktikum po kursu meteorologii, gidrologii i gidrometrii.** [Exercises for a course in meteorology, hydrology and hydrometry.] Moscow, Gosud. Izd-vo Sel'skokhoziaistvennoĭ Literatury, **1959.** 310 p. 89 figs., 84+19 tables, 20 refs., eqs. **DWB** (M79 L533pr)—This is a manual serving as a companion volume to the author's standard textbook on practical hydrology (11 B-88) for technical students of irrigation, reclamation, agriculture, etc. The 5 chapters of the meteorological section deal with calculations and analysis of series of data, rainfall, snow cover, moisture deficit, wind, evaporation from land and water surfaces and rainfall runoff relations. The 12 Chapters in the Hydrological section take up problems of river basin, runoff, seasonal, flood, low water probability, lake and reservoir and other engineering hydrology problems. Part 3 has 12 chapters on measurements at posts, on rivers, in ice, calibration of meters, calculation of runoff, bed load, etc. Many tables, monograms, forms, examples, useful graphs and equations are included. *Subject Headings:* **1. Hydrology manuals 2. Laboratory manuals.**—*M.R.*

12.6–15 551.551:551.501.7

*†Vorontsov, P. A., **Aerologicheskie issledovaniia pogranichnogo sloia atmosfery.** [Aerological investigations of the boundary layer of the atmosphere.] Leningrad, Gidrometeoizdat, **1960.** 450 p. 156 figs., 136 tables, bibliog. p. 437–438, 125 eqs. At head of t-p.: Glavnaia Geofizicheskaia Observatoriia. **DWB** (M51 V954ae)—The problems on structure of the boundary layer of the troposphere are discussed in detail with special attention to: thermal and wind conditions, air humidity in the lower 500 m layer, turbulence, vertical currents, transformation of air masses, aerological conditions of fog, causes of local wind, etc. Investigation of the lower layer of the atmosphere were made by the author with different aerological methods during long periods of time and the results were generalized. Major physical characteristics of separate local phenomena, developed in the boundary layer are observed during 24 expeditions of the Main Geophysical Observatory and materials are used by the author in following discussion. The list of these expeditions is given in the Introduction. The book contains the following ten chapters: (1) Boundary layer of troposphere and particularities on its structure, which is discussed with mathematical equations and graphical distribution on altitude. (2) Mean characteristics of distribution of temperature, wind, humidity and coefficient of turbulent exchange in the boundary layer are described in text with tabulated data and illustrated with graphs of their profile. (3) Structure of inversion (boundary, intensity above the land and water areas). (4) Turbulence and boundary layers (with tabulated data and graphic distribution). (5) Vertical currents of dynamic, thermal and orographic origin (graphs). (6) Micro-transformation of air masses (mathematically expressed and graphically illustrated). (7) Aerological characteristics of fogs of different classification of their origin and graphical illustrations. (8) Aerological characteristics and classification of breezes and their distribution above different topography. (9) Mountain and valley winds, their directions and intensities (graphs). (10) Föhns and katabatic winds. Their characteristics, origin and distribution. *Subject Headings:* **1. Boundary layer 2. Aerological research.**—*N.P.S.*

12.6–16 551.482.2

*†Kondrat'ev, N. E.; Liapin, A. N.; Popov, I. B. et al., **Ruslovoĭ protsess.** [Channel processes.] Ed. by N. E. Kondrat'ev. Leningrad, Gidrometeoizdat, **1959.** 370 p. 141 figs., 35 tables, bibliog. p. 362–370, 313 eqs. At head of t-p.: Gosudarstvennyĭ Ordena Trudovogo Krasnogo Znameni Gidrologicheskiĭ Institut. **DWB** (551.35 K82ru)—In this monograph the problems of river channel processes are considered from the standpoint of geomorphology and hydrodynamics. An attempt is made to unite both points of view into one general system, which might serve as a basis for a theory of channel process. Most attention is given to the nature of the channel process, its peculiarities and the factors that determine the differences in development. The action of water flow on the bottom is considered as the active basic factor. However, the hydrodynamics of the channel flow are considered only to the extent of their connection with the channel process. Certain problems of hydrodynamics that have already been discussed in other literature on the subject are mentioned briefly. The present monograph is for the attention of hydrologists, hydrotechnical engineers and for other scientific and practical workers. The questions of artificial changes in the regime of a river are discussed briefly in the preface. In the introduction and in Ch. I, the channel process is described as it appears, its forms and the nature developed by the authors. An attempt to make possible a more precise solution to the problem of calculation and prediction of the channel process is made. Chs. II, III, IV, and V are devoted to describing the present views of geomorphological nature of the process; the formation and development of river valleys; the erosion processes that are the primary sources of sediments; the formation of bottom land and river channels. Besides the review of existing literature on the subject, the author of these chapters (I. V. Popov) used his personal experience in creating his concepts, and describes his method of interpretation of aerial photographs of river channels and bottom lands. Ch. VI is written by S. I. Pin'kovskiĭ and contains the geographic aspect of the channel process as it can be applied to the Russian plain and Western Siberian lowlands. The study of cartographic and hydrologic material permitted the compilation of a map showing the distribution of various types of channel processes and established the connections between the peculiarities of channel processes and climatic, geologic, and geomorphological characteristics of the region. The

hydrodynamic aspect of the channel process is discussed in Chs. VII and VIII. Ch. VII devoted to a review of the existing theories of the motion of accretion. A special attention given to the study of experimental analysis of accretion motion. Besides a review of literatu on the subject, the author gives a description of theoretical structures worked out by him an analyses the phenomena that are insufficiently studied in scientific literature. The new idea on the subject are discussed. Ch. VIII contains a review of Soviet and foreign investigation of the motion of the flow at river bends. The transversal circulation of the flow velocities an the theory of this phenomenon are analysed. Ch. IX is devoted to an analysis of morpho metrical relations and contains a systematic review of present achievements in this area an personal work by the author. The monograph is well illustrated with diagrams, graph sketches, and photographs. There is a substantial bibliography attached. *Subject Heading* **1. River channel processes. I. Pin'kovskiĭ, S. I. II. Fedorov, N. N. III. Iakunin, I.** —*M.B.G.*

12.6–17 551.582.1(480

*†Platt, Raye Roberts (*ed.*), **Finland and its geography.** New York, Duell, Sloan an Pearce; Boston, Little Brown, **1955.** 510 p. 117 figs., 122 photos, 63 tables, bibliog. at en of each ch. Note: Ch. 14 on climate p. 326–361. 20 refs. Review by A. C. O'Dell in *Geo graphical Journal*, London, 23(4):529–530, Dec. **1957. DLC** (DK450.P53)—A magnificen text (fourth in a series of American Geographical Society Handbooks) on the history, govern ment, population, agriculture, manufacturing, forestry, minerals, fishing, transportation communication, commerce, vegetation, etc. of Finland. Ch. 14 (by F. K. Hare of McGil Univ., Montreal) comprises nearly 40 pages on the climate of Finland, with general climatic an synoptic charts, wind roses, energy budget diagrams, etc., specifically insolation, temp., wind humidity, precip. cloudiness, fog, climatic regions, thermal and moisture regimes according t Thornthwaite's 1948 scheme. Most of the charts and diagrams are taken from KERÄNEN and KORHONEN'S works of 1951 and 1952 or from the **Atlas of Finland.** *Subject Headings* **1. Climate of Finland 2. Finland. I. Hare, F. Kenneth.**—*M.R.*

12.6–18 551.508:63 551.501:63

*†Stružka, Vladimír, **Meteorologické přístroje a měření v přírodě.** [Meteorological in struments and measurements in the field.] Prague, Státní Pedagogické Nakl., **1956.** 519 p. 242 figs., 32 photos, 100 tables, bibliog. p. 499–515. (*Vysokoškolské Příručky.*) **DLC** (QC871.S85)—A handbook type text giving basic facts and definitions used in agricultural meteorology describing and illustrating all manner of meteorological instruments, giving instructions for making and recording observations for compiling climatic data and applying the data to practical problems such as occur in agriculture. A chapter is also devoted to climatic changes. An extensive bibliography of periodical and nonperiodical literature on instruments and observations in Czech., and an even more extensive bibliography of such sources in other languages is appended. The list of periodicals on p. 509 cites the *Meteorological Magazine*, **Berlin**; the *Monthly Weather Review*, **London**; the *Archiv für Met., Geoph. und Bioklimatologie*, **Berlin**; HMSO as the **Hydrological and Meteorological Office, London,** and similar anomalies. Extensive practical tables and charts for use in calculating observations or climatic data are included. *Subject Headings:* **1. Meteorological instruments and observations 2. Agricultural meteorology 3. Czechoslovak language textbooks.**—*M.R.*

12.6–19 551.582.1(569.3)

*†Vaumas, Étienne de (*Centre Nat. de la Recherche Scientifique, Paris*), **Le Liban (Montagne libanaise, Bekaa, Anti-Liban, Hermon, Haute Galilée libanaise): étude de géographie physique, I, Texte.** [Lebanon (Mount Lebanon, Bekaa, Pre-Lebanon, Hermon, upper Lebanese Galilee): study of physical geography, Vol. 1, Text.] Paris, Firmin-Didot, **1954.** 367 p. 47 figs., tables, foot-refs., bibliog. p. 318–327. **DWB** (551.4 V377Li)—The chapter on Lebanon's climate analyzes the temperature, precipitation, humidity and cloudiness as determined by its geographical location in the southern Mediterranean and as differentiated by its morphology. The system of pressures and winds is characterized in January by its location between Asiatic and Azores anticyclones. In winter Lebanon is a corridor open to cyclonic depressions blowing the Atlantic from west to east, responsible for all rain and snow of the

Near East. The heating of the continental mass of Asia, Arabia and Africa produces a huge zone of low pressure surrounding the whole Near East and eastern Mediterranean between winter and summer. The presence of a dry monsoon in the summer is in contrast to the winter cyclones originating in the Atlantic on which the system of precipitation depends. The sudden decrease of the latter from west to east is mainly due to the relief. Lebanon and Anti-Lebanon form an almost complete barrier against the advance of humid air toward the interior where the föhn phenomenon is recognizable. The distribution of raininess is likewise due to both relief and latitude, peculiarly sensible in the annual regime of precipitation with a summer minimum and a winter maximum, a dry and a humid period of six months each. The other characteristic of precipitation, its great variation, is evidently due to the latitude. The cloudiness is strong toward the Mediterranean side. The regime shows a distinct change in the central depression; the humidity is much less than in the west; the cloudiness equally less than that of the coast and conform to that of the Lebanese mountains (of Cedars). Temperature observations show also prevailing influence of latitude and relief. Latitude is responsible for the annual mean at the coast. The annual curves of temperature as those of precipitation are equally simple, determined by a minimum in winter and a maximum in summer. All the softening influences of the sea are blocked to the extent of 30 km by the Lebanon and result in a continental climate next to the Mediterranean. Few regions show in a similarly restricted area as many different climates as Lebanon does. The three-fold influence of latitude, relief and sea is responsible for five variations of the Mediterranean type of climate. The humid type of the coast is characterized by an elevated temperature throughout the year, by humidity as its dominant factor, the duration of its summer season, low precipitation rate, lack of frost and almost no snow. The rain terminating in March, the depressions of Khamsin changing the climate with complete dryness keeps the coast in an atmosphere of a stove. The humid montane type shows more contrast even by the more marked rhythm of the seasons. This region extends from 750–1000 m altitude including high Galilee, to the southwest point of the Hermon. The Mediterranean continental climate is marked by its thermal amplitude and dryness due to its intense luminosity. The Syrian and Saharian climate from the Bekaa meridian to the plains of Homs is governed by extreme aridity. Hermon and Anti-Lebanon represent the altitude types of the Mediterranean continental Syrian and Saharian climates. The various climates of the Lebanon, fundamentally Mediterranean are degrading this type toward the desert-type due to its location at the Near-East. No other region of the world has a shorter climatological transition than the Lebanon, especially at Makmel which separates two entirely distinct climatological worlds. There exist probably few regions with as many types of climate in an area of about 10,000 km². A precipitation chart, diagrams of precipitation, humidity and cloudiness, the extremes of temperature and a map of the climatic region illustrate the analysis. *Subject Headings:* **1. Climate of Lebanon 2. Climatic classification 3. Lebanon.** —*O.T.*

12.6–20 551.791 551.583.3

†Zeuner, Frederick Eberhard, **The Pleistocene period: its climate, chronology and faunal successions.** London, Hutchinson Scientific and Technical, **1959.** 447 p. 80 figs., tables bibliog. p. 381-421. **DLC** (QE696. Z4 1959). Review by Jean Tricart in *Scottish Geographical Journal*, Edinburgh, 75(3):175–178, Dec. **1959.** Review by D. F. W. Baden-Powell in *Nature*, London, 186(4728):833, June 11, **1960.**—This important work on the Pleistocene period divided into eleven chapters including the appendices and bibliography, is the result of studies bearing on the chronology of the last million years, carried out at the Institute of Archaeology in the University of London. The discussion is entirely concerned with the evidence for the relative and absolute chronology of the Pleistocene, for the various types of environment existing at certain times in certain areas, and with the evolution of the fauna found in deposits of known age. *Subject Headings:* **1. Pleistocene period 2. Pleistocene climate.**—*I.S.*

12.6–21 551.461.2:551.513(261,261.3,262)

*†Butorin, N. V., **Vekovye izmeneniia srednego urovniia Atlanticheskogo okeana i ikh sviaz' s tsirkuliatsieĭ atmosfery.** [Secular changes in the mean level of the Atlantic Ocean and their relation to the atmospheric circulation.] Leningrad, Akademiia Nauk SSSR, **1960.** 333 p. 12 figs., 2 tables, 49 refs., 3 appendices p. 40–333. At head of t-p: Akademiia Nauk

SSSR. Okeanograficheskaia Komissiia. **DLC** (GC481.B85)—Secular changes (since 186(in the mean sea level at a dozen places along the North and South Atlantic, Baltic, etc. a shown graphically, with 300 pages of detailed monthly and annual data for 37 places in th eastern Atlantic, 25 in the western Atlantic, 74 places in the Baltic, 35 in the Mediterranea (171 in all), appended. A curve shows changes at one place since 1811. Sea level change from 1891–1946, mainly positive, are correlated and tested statistically (for six stations) wit atmospheric circulation types. Most of the European stations show a strong positive correla tion of sea level with westerly types and weak or negative correlation with easterly flow an strong negative correlation with meridional types. *Subject Headings:* **1. Sea level changes ove Atlantic 2. Circulation type effects on sea level 3. Atlantic 4. Baltic 5. Mediterranear** —*M.R.*

12.6–22 551.582.1(477)(09

*Smoliakov, P. T., **Klimat Tatarii.** [Climate of the Tatar Republic.] Kazan, Tatgos izdat, **1947.** 107 p. 2 figs., 54 tables, 16 maps, 18 refs. **DLC** (QC989.R49S5)—A smal book summarizing the known facts about the climate and meteorology of the Tatar Republi up to 1944. A network of 31 stations (only a few such as Kazan which dates back to 1744 and with a meteorological station since 1812 with long records) is described and shown on map and in a table giving location and length of record of each. The history of observation and studies in the region from 1733 is presented in the first chapter. Physico-geographi factors are then reviewed; seasonal (dynamic) factors described; data presented in extensiv tables by elements and, finally, the climatic characteristics described element by elemen (sunshine and solar radiation; temperature; decadal, monthly, seasonal and annual growin season and extreme; soil temperature; cloudiness, humidity, precipitation, snow cover, wind closing and breakup of rivers, etc.) with illustrative tables and isopleth charts of the region *Subject Headings:* **1. Climate of Tatar Republic, U.S.S.R. 2. History of meteorological ob servations in Siberia 3. Kazan, Tatar, A.S.S.R.**—*M.R.*

A3. MONOGRAPHS

See also: **Atmos. pollution by aeroallergens** (Sheldon, Hewson), 12.6–290.

12.6–23 551.58

†Barger, Gerald and Nyhan, John C. (*eds.*), **Climatology at work: measurements, methods and machines.** Wash., D. C., U. S. Weather Bureau, Oct. **1960.** 109 p. 80 figs., 60 refs. **DWB**—The first chapter of the book includes introduction, history and development. In early years, a card index system was used to collect information, but machines were introduced at the end of World War II. Now the National Weather Records Center has 400 million punched cards. Ch. 2 deals with different aspects of climatology and its relation to other sciences. In some areas of human life, such as aerial navigation, weather is the primary factor. Ch. 3 deals with observation. The history of upper air observation is reviewed. The examples shown in the figures are typical of the bulk of current observational records. Most meteorological observations are obtained with the help of machines but some elements such as cloud type or precipitation type must be recorded from visual observation. Advances in electronics now make pictorial representation of the cloud system easy. Ch. 4 describes: climatological series, estimation of statistical parameters, and general statistical methods. In Ch. 5, various machines are described. In Ch. 6, the various results of climatological research are described. This information is distributed through publications, individual record copies and special studies. *Subject Heading:* **1. Climatological methodology.**—*A.H.K.*

12.6–24 551.557

Belmont, Arthur D., **Reversal of stratospheric winds over North America.** General Mills, Inc. Mechanical Division, Minneapolis, Minn., Contract AF 19(604):6618, Final Report, Feb. **27, 1961.** 33 p. 7 figs., 19 refs. **DWB**—The individual stratospheric reversals of 1957-1958 and 1959, and of the "normals" are summarized and compared. The erratic spring reversal occurs as the winter vortex is displaced from time to time by a warm high pressure cell moving from mid-latitudes to polar latitudes. Occasionally such intrusions prove tem-

porary and the vortex returns to its polar location; at other times, a complicated cellular pattern eventually develops into a stable summer polar anticyclone. Over the western hemisphere it is suggested that easterlies first appear at highest levels near 55–60°N in the early spring, then advance downward and northward in time. As the reversal process is not circumpolarly symmetric, southward progress is to be expected in the opposite hemisphere to the northward progression. The fall reversal appears to be far more regular and very rapid, starting in August near 55°N and propagating upward. By mid-September all the stratosphere north of 55°N has usually changed to westerly flow, only 2–3 weeks after its start. *Subject Headings:* **1. Stratospheric winds 2. Reversal of stratospheric winds 3. North America. I. General Mills, Inc. Mechanical Div. II. Contract AF 19(604)-6618.**—*Author's abstract.*

12.6–25 551.587 551.557.2(4/9)

*†Heastie, H. and Stephenson, P. M., **Upper winds over the world, Pt. 1–2.** *Great Britain. Meteorological Office, Geophysical Memoirs*, No. 103, **1960.** 217 p. tables, charts, 35 refs. Mostly charts. **DWB—Pt. 1, Average height of isobaric surfaces. Pt. 2, Average winds in the upper air.** Average contour charts for each of the mid-season months, January, April, July and October are given for each of the standard pressure levels from 700 mb to 100 mb. both mercator on projections for the whole world and on circumpolar charts for the Northern Hemisphere. Similar charts are given showing average streamlines and isotachs. Vertical cross sections up to 100 mb are also given showing the average zonal wind and potential temperatures along the longitudes 140 E, 75 E, 40 E, 10 W, 75 W, 130 W and 180 W in each of the mid-season months. The mean cross section for all latitudes is also given for each of the months. The data used were for the period 1949–53. A description of the methods used in constructing the charts is given as is also a bibliography of the data sources used. *Subject Headings:* **1. Upper air climatology 2. Upper air pressure 3. Upper air winds 4. Upper air temperatures 5. General circulation.**—*R.B.*

12.6–26 551.506.7(94)

*Australia. Bureau of Meteorology. **Upper air data, Australia: means of geopotential and temperature and median values of mixing ratio.** Melbourne, Director of Meteorology, **1958.** 238 p. Mostly tables. **DWB**—This publication contains mean monthly values of pressure and temperature at the surface, and geopotential and temperature at the 1000, 900, 850, 800, 700, 600, 500, 400, 300, 200, 150 and 100 mb pressure surfaces for all Australian radiosonde stations for each month of record up to December, 1955, with the exception that temperature values are not given for the 1000 mb level. Monthly median values of mixing ratio for levels to 600 or 700 mb are also included. Information regarding instrumental equipment, times of observation, duration of records, units and methods of computation, and a list of station heights and co-ordinates has been provided to facilitate use of the tabulated data. *Subject Headings:* **1. Upper air data 2. Australia.**—*Author's abstract.*

12.6–27 551.506.5(265/266) 551.506.7(268/266)

*U. S. Joint Task Force Seven, **Meteorological report on Operation Redwing, Pt. 1, Meteorological data.** issued **1956.** Contents: **Vol. 1, Eniwetok. Vol. 2, Rongerik. Vol. 3, Kusaie.** About 400 p. each. Loose-leaf. Almost entirely tables. **DWB** (M06.2/96 U585m)—In this series of 12 volumes of meteorological data, the 3-hourly surface observations, 3 or 6 hourly wind aloft data for standard levels (thousands of ft), and 4 times daily (or more frequent) radiosonde data for standard pressure surfaces and significant points and tropopause are presented *in extenso* for 10 Pacific Island stations during Operation Redwing April 15 to July 31, 1956. Vol. 11 and 12 cover ship observations and aircraft weather reconnaissance data. Pt. II will contain streamline analyses for 6 levels (up to 80,000 ft). *Subject Headings:* **1. Operation Redwing data 2. Upper air wind data 3. Radiosonde data 4. Observational data 5. Pacific Islands.**—*M.R.*

12.6–28 551.524.7:551.510.53

*†Behr, Karin, **Über markante Erwärmungen in der Stratosphäre: Entdeckung, Beispiele, Theorien.** [Marked warmings of the stratosphere: discovery, examples and theories.] *Berlin. Freie Universität. Institut für Meteorologie und Geophysik, Meteorologische Abhandlungen,*

9(2), **1960.** 57 p. 23 figs., 3 tables, 174 refs. **DWB**—Synoptic descriptions of the warming include evidence for the warming in late winter 1952 and further warming up to 1958. In th discussion of the possible causes —both extraterrestrial and terrestrial theories are elaborated The paper is well documented with pertinent illustrations and tables. *Subject Heading* **1. Stratospheric warming.**—*E.Z.S.*

12.6–29 551.587(213):581.5

*†Troll, Carl, **Die tropischen Gebirge: ihre dreidimensionale klimatische und pflanzen geographische Zonierung.** [Tropical mountains: the horizontal and vertical zonation of thei climate and vegetation.] *Bonner Geographische Abhandlungen*, Bonn, No. 25, **1959.** 93 p 28 figs., 6 tables, bibliog. p. 89–93. English summary p. 86–88. **DLC**—This monograph on the relationship of the vegetation of tropical mountains to the vertical zonation of their climate: comprises the following, viz: a review of Alexander v. Humboldt's investigations and con ceptions of the zonation of tropical vegetation; the three dimensional point of view in physica and biological geography; the thermal characteristics of the tropical rain forest; the geographical manifestation of diurnal climate including polygonal soil structure, snow and glaciers the upper forest and tree line, and forms of Indian agriculture in the High Andes; the altitudinal zones of the humid tropics as shown in Malaya, East Africa, Ethiopia and the Andes; the hygric zones of the high mountains in the tropics including those of the tropical Andes, the characteristics of the paramos of America, East Africa and Australia and of the puna region of Peru, Bolivia and Chile; the influence of orography upon the spatial picture of vegetation as exemplified by the Cordellera Real, Yungas, and Valle de la Paz; the immigration of boreal plants into the mountain forests of Mexico and Central America and the characteristics of the vegetation of the mountainous regions of Mexico; the genetic relationship of tropical high mountain flora to the holarctic and Antarctic flora, including a discussion of Indo China, the plant geographic counterpart of Mexico in the old world, the relationship between tropical mountain flora and the holarctic, the subantarctic tropical-Montane flora and the floral historical importance of the tertiary mountain flora. *Subject Headings:* **1. Tropical mountain climates 2. Climatic zonation 3. Orographic effects 4. Holarctic flora 5. Antarctic flora.** —*I.L.D.*

12.6–30 551.55(431.1) 551.582.1(431.1)

*†Böer, Wolfgang, **Das Klima von Potsdam, II, Die Mittlere Windversetzung in Potsdam.** [Climate of Potsdam, Pt. 2, Average wind movement in Potsdam.] *Germany. Deutsche Demokratische Republik, Meteorologischer und Hydrologischer Dienst, Abhandlungen*, 7(53), **1960.** 83 p. 25 figs., 9 tables, 25 refs. **DWB, DLC**—A detailed study of average wind movement in Potsdam. Materials and methods of obtaining monthly and daily values and their degree of accuracy are discussed. Harmonic analysis of annual wind movements is followed by analysis of the linkage between geostrophic and actually observed wind movement, the difference between them in individual merit, and finally the relationship between wind movement, temperature, precipitation and global radiation are discussed. A table of average vectors in wind movement in Potsdam for each month since 1894 is appended. A general view of the relationship between wind movement, temperature, precipitation, and global radiation is expressed in tabular form showing the relations in both summer and winter and under various conditions. Various aspects of the problems are represented graphically. *Subject Headings:* **1. Wind movements 2. Climate of Potsdam 3. Potsdam, Germany.** —*E.Z.S.*

12.6–31 551.515.3(784)

Fujita, Tetsuya (*Univ. of Chicago*), **Detailed analysis of the Fargo tornadoes of June 20, 1957.** *U. S. Weather Bureau, Research Paper*, No. 42, Dec. **1960.** 67 p. 79 figs., 4 tables, ref. **DWB** (M(055) U587r)—On June 20, 1957, the Moorhead area of North Dakota became the center of a high tornado related thunderstorm that consisted of the following five separate tornadoes: the Wheatland, Casselton, Fargo, Glyndon and the Dale, each with identical characteristics. A dust cloud in a whirl-wind along an 11 mi path passed over Wheatland and was accompanied aloft by a long and narrow funnel. This was immediately succeeded by the Casselton storm whose path over the township was estimated at 5 mi. The cone-shaped

Glyndon and Dale tornadoes had long rope-type funnels and their damaging paths were estimated at 10 and 7 mi, respectively. The Fargo tornado, the most effective of all, approached from the west as a rotating cloud with a similar rope-type characteristic and a damaging path of about 9 mi. It later found its way into Minnesota. But before its dissipation, its extreme east and west ends had extended over 64 mi, with 35 mi of its path in North Dakota and 29 mi in Minnesota. More quantitative information was obtained on this storm than on either of the other five, therefore, the entire report is devoted primarily to its analysis. A chronological arrangement of over 500 original and processed photographs taken by various observers of the five tornadoes is given. These pictures indicate the characteristic features of the individual tornadoes. The rotating Fargo cloud was characterized by a wall, a tail, a collar and a disc system. This report discusses all the available details on the mother cloud, the changes in the shape of the tornado funnel, its rotational speed which was estimated at 230 mph, as well as the relative motion of any similar tornadoes in relation with a rotating cloud. It also includes the schematic diagram on various aspects of the tornadoes and the investigations of the pressure field beneath the rotating cloud, the liquid water storage, and the velocity profiles of its wind systems at various elevations over the area. To understand and explain the irreversible process in the air that flowed in to replace the rising air and the associated tornadic circulation problems, the author suggests the application of the second law of thermodynamics and a detailed photogrammetric analysis of tornado funnels. By the first suggestion, an explanation of the condensation pressure phenomenon can be found. *Subject Headings:* **1. Tornado analysis 2. Tornado, Fargo, N. Dak. (June 1957) 3. Fargo, N. Dak.**—*N.N.*

12.6–32 551.585.53:551.579

†Schoeller, Henry (*Bordeaux Faculty of Science*), **Arid zone hydrology: recent developments.** *UNESCO- Arid Zone Research*, Vol. 12, **1959.** 125 p. 29 figs., tables, 222 refs. Price: 12 sh 6 d. **DLC** (GB1003 S32). Review in *Royal Met. Society, Quarterly Journal*, 86(368):291, April **1960.** Review in *Arid Zone*, Paris, No. 4:18, June **1959.**—Ch. I deals with the formation of bodies of ground water, their replenishment and the water resources they represent. Ch. II covers ground water prospecting and development. Ch. III discusses new methods for determining the transmissibility of aquifers. One of the best methods for determining transmissibility is from the nonequilibrium discharge of wells and borings. Ch. IV is a general outline of geochemistry of ground water. It points out changes which occur in stored ground water, in contact with rocks and through climatic factors. Ch. V deals with the use of tracers, particularly radioactive tracers. There is need for tracers with half lives of weeks or months. The importance of microcirculation of water in rocks is emphasized. *Subject Heading:* **1. Arid zone hydrology.**—*E.Z.S.*

12.6–33 551.579.4:551.588.6(479.24)

*†Mamedov, T. M., **Selevye potoki i lesovodstvennye mery bor'by s nimi.** [Mudflows and forestry measures for controlling them.] Moscow, Goslesbumizdat, **1960.** 88 p. 16 figs., 20 tables, 122 refs. **DWB** (551.35 M264se)—A pamphlet outlining results of recent research on mud flows, landslides and erosional floods (flash floods) on the southern slopes of the Caucasus and in the neighboring mountain regions of Azerbaidzhan, and on measures taken to prevent or control these destructive floods. The effect of natural vegetation, forests, planting of forests or trees of various species is treated in several chapters. The character of erosion and flash flood processes in Azerbaidzhan, the physical conditions of the region and the history of research in this field is reviewed in other chapters. *Subject Headings:* **1. Flash floods in Azerbaidzhan 2. Soil erosion control 3. Mud flow control 4. Forest influences on mud flows 5. Azerbaidzhan S.S.R.**—*M.R.*

12.6–34 551.48:778.35(282)

Popov, I. V., **Aerofotos"emka i izuchenie vod sushi.** [Aerophotography and the study of inland water.] Leningrad, Gidrometeor. izdat., **1960.** 164 p. 53 figs. (1 fold.), tables. **DWB** (778.35 P829ae)—The basic methods are described in popular form for use in aerial photography for the study of the characteristics of river, lakes, swamps, water reservoirs, sea coasts and other land marks. The first portion of the book contains a brief review of

historical developments (since 1725) in the fundamentals of the chemistry and optics photography in general and in flying from an early period on kites and balloons to more rec aircraft and rockets. The methods of photographing of various objects, selection of pro scale, processing of the superimposed maps, decoding of the reliefs and basic characteris of the objects are described with details and many illustrations. The other part of the bo contains the analysis of actual photographs of river flow, arrangement of swamps and th drainage, lake, agricultural land and forests, snow and ice cover, location and arrangeme of mountain slopes, gorges, stream, etc. and other objects of the hydrological and geologi nature are also included in this part. The author gives special attention to the significa of aerial photography in hydrological investigations, in designing and construction of water a power supply installations, control of floods, irrigation and reforestation, and also for use general study and development of natural resources. *Subject Heading:* **1. Aerial photograp of inland water.**—*N.P.S.*

12.6–35 551.501:551.578.

*California. Dept. of Water Resources. **Summary of California snow survey measu ments through 1959.** Issued Dec. **1959.** 354 p. Almost entirely tables (9 p. text). plates (fold.). On c-p: California Cooperative Snow Surveys. **DLC** (QC929.S7C27)—TI publication contains a summary of all snow survey measurements made in California for whi the Department of Water Resources has records. A brief history of snow surveys in Ca fornia, a glossary of terms used, and an index by river basins are included. Snow cour location maps (topographic) are appended. *Subject Headings:* **1. Snow survey data 2. Ca fornia.**—*E.Z.S.*

12.6–36 551.506.8(43-1

*Seyfert, Franz, **Phänologische Tabellen 1951–1953 aus dem Gebiet der Deutsch Demokratischen Republik.** [Phenological tables 1951–1953 in the German Democrat Republic.] *Germany. Deutsche Demokratische Republik. Meteorologischer und Hydr logischer Dienst, Abhandlungen*, 7(50), **1960.** 433 p. Almost entirely tables. **DWB, DLC** A massive compilation of phenological data from 892 stations in the DDR for 1951–195 Vol. 1 covered data for fewer stations for 1947–1959. An index of stations by code number (a shown on large map), a regional index and an alphabetical index are appended. Data a given for 22 natural indicators and 21 cultivated crops or fruits. *Subject Headings:* **1. Phen logical data for East Germany 2. East Germany.**—*M.R.*

12.6–37 551.501.81:551.509.329:551.510.72

Austin, Pauline M., **Application of weather radar to fallout prediction.** Massachuset Institute of Technology. Dept. of Meteorology. Weather Radar Research, Contrac DA-36-039-Sc-75030, Quarterly Technical Report, No. 10, June 1, 1960–Aug. 31, 196 (Issued) Sept. 15, **1960.** 16 p. 10 figs. **DWB**—During the past quarter excellent radar dat in the form of signal intensity contours and REI photographs have been obtained for 2 summer storms including several squall lines. In addition, a few measurements of the re flectivity at two wavelengths of clear-air echoes from the vicinity of a sea-breeze front, som concurrent echo-intensity and fluctuation-rate records, and several simultaneous radar an rain gage observations were made. All of the intensity-contour data from the summer o 1959 and some selected storms from 1960 have been transcribed from 35 mm film to contou maps on transparent paper. Also the data from six instability lines observed to 1958 hav been digitalized. Some of the rainout computations have been completed. The results ar discussed in detail in a thesis and are summarized in this report. They show the effect on the distribution of radioactive fallout at the ground, 12 hours after a one-megaton detonation of "standard" showers inserted at selected points 3, 6, and 9 hours after the detonation an also the modification produced by a widespread rain area. Further investigations of rainou in the case of a megaton detonation are being planned and, in addition, machine programs are being set up to compute the effects of rainout in the case of 10 KT and 0,1 KT detonations. *Subject Headings:* **1. Weather radar for fallout forecasting 2. Radioactive fallout forecasting.** —*Author's abstract.*

12.6–38 551.506.1(99:42)

*Falkland Islands and Dependencies. Meteorological Service, **Annual meteorological tables 1958 (prepared in conjunction with the Meteorological Office, London)**. Stanley, Falkland Islands, **1960.** 167 p. Mostly tables. **DWB**—Meteorological data for 9 stations are presented in tabular form for 1958. An appendix gives the data for Halley Bay for the period 1956–1959. The data consists of surface observations and upper air observations. The British radiosonde system is used for upper air observations in which pressure, temperature and relative humidity are measured by variable audio-frequency modulation of a carrier signal of constant frequency. *Subject Headings:* **1. Annual meteorological data summaries 2. Falkland Islands.**—*I.S.*

A4. POPULAR

12.6–39 551.46

†Diomidov, Mikhail Nikolaevich and Dmitriev, Aleksandr Nikolaevich, **Pokorenie glubin.** [Sounding the deep.] Leningrad, Gos, Soiuznoe Izd-vo Sudostroit. Promyshl., **1959.** 175 p. figs. (incl photos), 39 refs., eqs. **DLC** (GC57.D55) A popular (26,000 copies) account of methods of exploring the sea and of sounding (by means of bathometers, bathyscaphes, dredges, hydrostats, etc.), photography, study or analysis, etc., and the results of these explorations and studies, their economic importance (e.g., for fisheries), etc. Equipment is described in detail and illustrated. Expeditions and equipment used in the U.S.S.R. are emphasized. *Subject Headings:* **1. Oceanographic soundings 2. U.S.S.R.**—*M.R.*

12.6–40 551.46(023)

Gaskell, Thomas Frohock, **Under the deep oceans: Twentieth Century voyages of discovery.** N. Y., W. W. Norton, **1960.** 239 p. 8 figs. **DLC, DWB** (551.4608 G248un)—A book on the general subject of oceanography or marine geology intended for the interested reader in other fields of study. Chapter headings suggest the scope of the book—modern style geographical exploration, the earth and the oceans, the Mohole, seismic prospecting, deep sounding, coral atolls, layer 2, sea-bed sediments, natural history, the Mediterranean, the wandering continents and deep drilling. Methods and procedures used in oceanographic investigations are described. Explanation is given of the difficulties in drilling in very deep water. The Mohole project is discussed in relation to its scientific value and cost. *Subject Headings:* **1. Oceanography 2. Marine geology.**—*E.Z.S.*

12.6–41 551.462

Larionova, Antonina Nikolaevna, **Puteshestvie po morskomu dnu.** [Expedition along the bottom of the sea.] Leningrad, Gidrometeoizdat, **1959.** 102 p. 32 figs., table, 5 refs., 33 foot-notes. **DLC** (GC83.L3)—A well-illustrated pamphlet for the nonspecialist, reviewing the history of ocean bottom exploration, sounding and structural studies of the bottom relief. Methods of sounding used since MAGELLAN (1521) and of charting (since the first relief map of the Atlantic's bottom in 1854) are described. Echo soundings suggested by ARAGO in 1807 have been employed since 1855. Factors causing the various forms of bottom relief (tectonic forces, erosion, waves, currents, tides, precipitates, ice, corals, volcanism, etc.), classification of bottom types, charts and cross sections showing types; present day diving methods and equipment, bathyspheres, bathyscaphes; attempts at finding the deepest part of the Pacific and other matters are treated systematically. *Subject Headings:* **1. Bottom explorations 2. Bottom relief 3. Oceanographic investigations 4. History of ocean sounding.** —*M.R.*

A5. HANDBOOKS—MANUALS—ATLASES

12.6–42 551.510.62(02) 551.509(26)

U. S. Hydrographic Office, **Radio weather aids.** Its *H. O. Publication*, No. 118 (formerly No. 206), **1958.** Issued 1959–1960. Issued in 7 parts, each separately paged. Maps, forms, refs. on p.v. of introd. Loose-leaf. Price with binder, $4.50 (without binder, $3.00) from U. S. Govt. Print. Off. **DWB** (M09.1 U58ra)—This first of two large looseleaf volumes of this

authoritative guide for identification, plotting and analysis of weather broadcast data f all parts of the earth contains five main parts: I. General information on weather service ships, a list of over 100 code type abbreviations used in analysis and transmission, a lis Atlantic and Pacific Ocean Weather Stations as of Jan. 1958, instructions and WBAN symb for map analysis, a list of radio stations accepting ship observation messages; II. Detail scheduled marine broadcasts by country under each continent; III. Synoptic broadcasts (a by continent, country and station; IV. Facsimile broadcasts; V. Codes; VI. Code forms a VII. Conversion tables, the Morse code, etc. The many codes and specifications are spel out in great detail with examples of their use. The same is true for the broadcast schedu *Subject Headings:* **1. Radio weather aid handbooks 2. Marine weather broadcasts 3. Syno weather broadcasts 4. Synoptic codes.**—*M.R.*

12.6–43 551.501.9:551.509(

U. S. Hydrographic Office, **Weather station index.** Its *H. O. Publication*, No. 119 (for erly 207), **1958.** Issued **1958–1959.** Issued in sections, separately paged. Sec. 1, 431 Sec. 2, Supplementary U. S. station listing, 5 p. chart (fold.). **"Changes"** issued to inserted in binder. Price with binder, $4.50 (without binder, $3.00) from U. S. Govt. Pri Off. **DWB** (M01.9 U585we)—This second of two large looseleaf guides to internatio synoptic codes and networks contains the latest lists of international station index numb a chart showing blocks of numbers, and supplementary lists of U. S. Navy and Air Fo stations. **Change 2** (May 1960) lists several hundred stations in mainland China and pe pheral areas not heretofore available. Coordinates for most stations are given and all stati are arranged by block number which is essentially an arrangement by continent and countr *Subject Headings:* **1. Weather station index 2. World meteorological networks.**—*M.R.*

12.6–44 551.509.31(0

§†U. S. Weather Bureau, **Synoptic meteorology as practiced by the National Meteorologic Center, Pt. 1, Analysis. The NAWAC manual,** by the staff, National Weather Analys Center. Washington, D. C., Oct. **1960.** 35 p. 23 figs., 23 refs. NOTE: "Pt. 2 bei written, available soon." Loose-leaf. Price 25 cents from U. S. Government Printing Offic **DWB** (M09.3 U587syn)—The National Weather Analysis Center at Suitland, Md. has present a staff of 60 meteorologists, including 11 leading analysts, 24 principal analysts, and regular analysts. Most of these, including several who have left the center (A. K. SHOWALTE V. J. OLIVER, C. M. LENNAHAN and L. L. MEANS), contributed greatly to this manual. It in loose-leaf form, alas, so as to allow for numerous and frequent revisions. The sever parts consist of: Chart 1, Basic principles of analysis; 2, Sea-level analysis; 3, Upper lev analysis (1000–500 mb thickness, 500 mb, 760 mb, 850 mb, 300 mb, 200 mb, 100 mb a maximum wind analysis); 4, Supplementary analyzed charts (freezing level, precipitable wat 12-hour pressure change at sea level, cloud and precip., snow cover and stability index Many analyzed charts are included by way of example. *Subject Headings:* **1. Synoptic analys manuals 2. National Weather Analysis Center. I. Burnett, F. W. II. Lennahan, C. M** —*M.R.*

12.6–45 551.5:91:37

Tessman, Nikolaĭ Fedoseevich, **Polevaia praktika po meteorlogii i gidrologii.** [Fiel work in meteorology and hydrology.] Moscow, Gos. Uchebnopedagog, Izd-vo, **1959.** 92 p 46 figs., tables, refs., numerous eqs. **DLC** (QC869.T4)—A small textbook on practical meter ology and hydrology for geography courses in teachers colleges. The section on field practic in meteorology covers: 1) weather and its forecasting, 2) microclimatic observations, 3) fiel trips with groups of school children. The section on field practice in Hydrology covers 1) ground water, 2) rivers, 3) lakes, 4) maps and 5) excursions in hydrology with students The treatment is quite technical for this type of text. Many instruments and types of equip ment, their manipulation and compilation of observations are illustrated and theory especiall in the section on hydrology. *Subject Headings:* **1. Meteorology and hydrology field wor 2. Geography courses in meteorology 3. U.S.S.R.**—*M.R.*

12.6–46 551.506.7:551.557

*Crutcher, Harold (*Meteorologist, U. S. W. B.*), **Upper wind statistics charts of the Northern Hemisphere (850, 700 and 500 mb levels).** *U. S. Office of Naval Operations, NAVAER* 50-1C-535, Vol. 1, Aug. **1959.** 33 p. of text. 8 figs. numerous unnumbered charts, 35 cm×50 cm. 23 refs. Loose-leaf. Also: **Upper wind statistics charts of the Northern Hemisphere (300, 200 and 100 mb levels).** *Ibid.*, Vol. 2, Aug. **1959.** 35 p. of text. 8 figs. numerous unnumbered charts, 35×50 cm. (same 10 refs. as in above title). Loose-leaf. **DWB** (M57 G957up), **DLC** (QC995.U665)—"In 1958, the *U. S. Weather Bureau Technical Paper* No. 34, **Upper wind distribution statistical parameter estimates,** by H. Crutcher, was the first U. S. Government publication to treat this subject on a hemispheric basis. This present publication is one of a series, prepared by the U. S. W. B. for the U. S. Navy, presenting a cartographic analysis of the data in *Technical Paper* No. 34, supplemented by additional data specifically prepared for this series." This handsome atlas contains, in addition to six large pages of explanations and references, a large number of isopleth charts and transparent overlays giving world-wide (N. Hemisphere) data on: 1) isotachs of vector mean wind speed, 2) isogons of vector mean wind direction, 3) vector standard deviations, 4) zonal mean wind speed and 5) standard deviation theory, 6) meridional mean wind speed and 7) standard deviation thereof, 8) correlation between zonal and meridional components, 9) angle of rotation, 10) S.D. of major and 11) of minor axis components, 12) scalar mean wind speed and 13) scalar s.d., 14) constancy, with 24 charts for each of the foregoing, i.e., in Vol. 1 for 850 mb, 700 mb and 500 mb surfaces, in Vol. 2, for 300, 200 and 100 mb for each season, respectively. A station location chart of the N. Hemisphere, a chart showing the period of record of various blocks of data and, finally, 13 charts and a table giving auxiliary data, nomograms and aids used or useful in computations are included. The charts are intended for use in constructing wind distribution graphs or tables for any place in the N. Hemisphere for which data are available. The basis for the entire work is the premise that the elliptical normal distribution more closely approximates the actual wind aloft distribution in the N. Hemisphere than does the circular normal distribution used (with acknowledged reservations) as a first approximation by Brooks, Durst et al. (*see* 4E–139 and 4E–186, May 1953, *Met. Abs.*). Applications such as for estimating average aid or retard winds over an air-route, probable trajectories of radioactive fallout or air pollution, average movements of cyclones or anticyclones and winds affecting rocket launching or re-entry are obvious. Applications for research are not so obvious but are probably just as numerous. *Subject Headings:* **1. Upper wind statistic atlases 2. Elliptical normal wind distribution 3. Northern Hemisphere wind aloft atlases.**—*M.R.*

12.6–47 551.552:551.582.3(261/264)

*Markgraf, Hans (*Abteilung Maritime Meteorologie*), **Die vorherreschenden Winde auf dem Atlantischen Ozean im April und Oktober nach Beobachtungen deutscher Schiffe aus dem Zeitraum 1925–1939 (nebst zusammenfassenden Darstellungen einschliesslich der Monate Januar und Juli.)** [Prevailing winds in the Atlantic Ocean in April and October according to observations by German ships from 1925–1939 (complementing charts for Jan. and July).] *Hamburg. Seewetteramt, Einzelveröffentlichungen,* No. 25, **1960.** 10 p. mostly maps. **DWB**—A collection of charts showing the prevailing winds on the Atlantic Ocean in April and October according to observations made by German ships during the period 1925–1939, and including a summary description inclusive of the months January and July. Charts for April and October show prevailing winds according to direction and force, presented as wind arrows representing both aspects, the prevailing winds according to direction, force and persistence arranged in current lines, and single lines and regions of at least 50% greater persistence than the prevailing air currents and in addition the position of the convergence lines and the subtropical divergence lines for January, April, July and October are shown on separate charts. Two charts show the wind rotation from January to July, and from July to January, respectively. Finally, a combination of tables and a map of the principal ship routes provide information on prevailing winds, direction, force, and persistence along the major navigation routes. *Subject Headings:* **1. Prevailing winds over Atlantic 2. Wind atlas for Atlantic 3. Atlantic Ocean.**—*E.Z.S.*

12.6–48 551.326.7:778

Moscow. Gosudarstvennyĭ Okeanograficheskiĭ Institut. Leningradskoe Otdele **Al'bom aerofotosnimkov ledovykh obrazovaniĭ na moriakh.** [Album of aerial photogra of different forms of ice occurring in the sea.] Leningrad, Gidrometeoizdat, **1960.** 22 140+15 figs., 4 tables, charts. **DWB** (551.34 U581aL)—The 150 odd full-page aerial pho graphs of ice formations in the Arctic and Antarctic seas, continental ice (glaciers, ice ca shelf ice and icebergs) are selected with great imagination and arranged systematically w ample annotations as to ice classification schemes, the International Ice Nomenclature (19 and an English language index (alphabetical) of ice terms and their Russian equivalents a relevant photographs in the atlas, ice symbols used on charts and, finally, an alphabeti index in Russian. *Subject Headings:* **1. Ice form atlases 2. Aerial photographs of sea forms.**—*M.R.*

A6. IGY—ARCTIC—ANTARCTIC

IGY

See also: **From the Arctic to the Antarctic** (Riabinin), 12.5–65; **Participation of Ukrainian Hydromet. Sci. Res. Inst. in IGY** (Prikhot'ko), 12.6–74; **Gravity obs. during IGY** (Woollard), 12.6–211; **Pendulum and gravimeter measurements of earth's gravity** (Woollard), 12.6–212; **IGY radiation program** (Ashbel), 12.6–337.

12.6–49 551.506.22 551.5:550.3:06

International Geophysical Cooperation-1959. *American Geophysical Union, Transactio* 40(4):375–381, Dec. **1959.** table. **DWB, DLC**—The International Geophysical Cooperati 1959 (IGC-59), successor of IGY, represents another phase of international, coordinat studies. Table 1 presents the "Summary of Programs in IGC-59. Disciplines and Ar of Study." The U. S. IGC-59 program consists of three parts: (1) contributed effort fr public and private institutions, (2) incorporation of major programs, including the 19 Antarctic research and space science activities, (3) a small group of projects requiring spec funding by the National Science Foundation. *Subject Headings:* **1. International Geophysic Cooperation-1959 2. U. S. IGC-1959 program.**—*E.K.*

12.6–50 551.506.22:551.507.362.2 551.5:550

The International Geophysical Year. *Geographical Review*, N. Y., 48(1):117–118, Ja **1958. DWB, DLC**—A brief summary of activity during the IGY, namely: events leading to the launching of Soviet satellite Sputnik, U. S. plans for launching satellites, of Operati Deepfreeze III which recorded a world low temperature record of −102.1°F and provide evidence that Antarctica is a group of islands, the setting up of tide gages in the Arctic, th discovery of a mountain range of 5000 ft elevation on the ocean bottom by drifting station A the McCall Glacier Project in the Brooks Range of Alaska, rocketry projects at Fort Churchil aurora studies, etc. *Subject Heading:* **1. International Geophysical Year, 1957–1958.**—*I.L.*

12.6–51 551.506.22:551.50

Pushkov, N. V., **Spetsial'nye Mirovye intervaly.** [Special World Intervals.] *U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby. Komitet po Provedeniiu Mezhdunatodnog Geofizicheskogo Goda, Informatsionnyĭ Sbornik*, No. 4:111–112, **1957. DWB**—The Specia World Intervals are periods of time from one to several days established during the IGY fo making frequent observations on solar activity, the terrestrial magnetic field, the ionosphere cosmic rays, auroras, etc., and also for making aerological observations at various stations These differ from the World Meteorological Days for making atmospheric soundings; these ar always in June, September, December and March, and their duration is uniform—10 days The Special Meteorological Intervals, however, will be announced depending upon the condi tion of solar activity and probability of occurrence of auroras and large magnetic and ionospheri disturbances, etc. The Special World Intervals are to begin and end at zero hours world time These intervals are to be announced in Washington, D. C. after consultation with a number o regional centers of Special World Intervals. The announcement of such intervals is by radio by meteorological teletype network or by telegraph. The stations receiving telegraphic in formation are meteorological stations capable of photographing auroras and aerological stations

near stations continuously recording cosmic ray radiation. *Subject Headings:* **1. Special World Intervals 2. IGY observation program.**—*I.L.D.*

12.6–52 551.506.22:523.755

*Newkirk, G., Jr.; Curtis, G. W. and Watson, K., **Observations of the solar electron corona, Sept. 1956–Jan. 1958.** *International Geophysical Year, 1957/1958. IGY World Data Center A [for] Solar Activity, High Altitude Observatory, Boulder, Colorado, IGY Solar Activity Report Series*, No. 4, Aug. 15, **1958.** 48 p. numerous charts, table, 12 refs., 5 eqs. **DWB** (523.74 I612so)—This report provides the available data on the reduced observations of the electron corona, and is presented logically to cover the details on the calibration of K-corona-meter, the sky signal, the collected observations, and the polarization angle. The results of each observation are plotted graphically. *Subject Headings:* **1. Solar electron corona data 2. IGY solar activity program.**—*N.N.*

12.6–53 551.506.22(98/99)

Tiedemann, Karl Heinz (*Kiel*), **Das Internationale Geophysikalische Jahr in den Polargebieten.** [The IGY in the polar regions.] **Polarforschung,** Kiel, Series 4, 27(1/2):41–43, **1957.** pub. 1959. table. **DLC**—A brief account is presented of the existing and planned observation stations in the Arctic and the various nations sponsoring these stations in connection with the current IGY program. In Antarctica 67 stations under the control of 12 nations are taking part in IGY program. The names of the stations, grouped by nationality and their geographical coordinates, are presented. *Subject Heading:* **1. IGY polar program.** —*I.L.D.*

12.6–54 551.506.22:523.7(54)

Programme of IGY solar observations in India. *Journal of Scientific and Industrial Research, Sec. A*, New Delhi, 17(12), Special Supplement, Dec. **1958.** p. 68–69. **DWB, DLC** —The brief outline deals with the activities of the (1) Kodaikanal Observatory and the (2) Nizamiah Observatory. *Subject Headings:* **1. IGY solar activity program 2. Indian participation in IGY.**—*W.N.*

12.6–55 551.506.22 551.5:550.3:061.3

U. S. Congress. House. Committee on Appropriations, **National Science Foundation, National Academy of Sciences. Hearings before the Subcommittee of the Committee, 86 Congress, 1st Session. Report on the International Geophysical Year, Feb. 1959.** Wash., D. C., U. S. Govt. Print. Office, **1959.** 197 p. **DWB** (551.06 U582naE—Detailed hearings on continuation of some phases of IGY cooperation during IGC (1959), including testimony of U. S. members of National Committee for IGY (Berkner, Bronk, Gould, Japlan, Reichelderfer, Revelle, Roberts, Shapley, Tuve, Van Allen, Waterman, Wexler and Woolard). Stress was placed on data centers, aurora, oceanography, rocket, satellite, whistlers, Antarctic and meteorological studies. Termination of activities was also discussed. *Subject Headings:* **1. International Geophysical Cooperation (IGC)-1959 2. Congressional hearings on IGY.**—*M.R.*

12.6–56 551.506.22:551.510.535(42)

Station de Recherches Radioélectriques du D.S.I.R., Slough, England: distributions verticales de la densité électronique dans l'ionosphère pendant l'A.G.I. [Stationfor Wireless Research of the D.S.I.R., Slough, England. Vertical distributions of the electronic density in the ionosphere during the IGY.] *International Scientific Radio Union, Brussels, Bulletin d'Information*, No. 109:14–17, May/June **1958.** 2 tables, 2 refs. **DLC**—The object of this note is to outline the computation program (electronic calculators) organized by the Station for Wireless Researches of the Department of Scientific and Industrial Research, at Slough, in order to determine the vertical distribution of the electronic density aloft in the ionosphere, the ionograms being the basis of this study. The realization of this work is a part of the program of the United Kingdom during the IGY. *Subject Headings:* **1. IGY ionosphere program 2. Ionospheric electron 3. Slough, Eng.**—*A.V.*

12.6–57 551.506.22:551.501.9(798)(084)

Young, M. J. (*comp.*), **Catalogue of IGY all-sky camera data for Alaskan statio** Alaska. Univ. Geophysical Institute, NSF Grant Y/1.14/177, Scientific Report No. 3 on IG Project No. 1.14, July 31, **1959.** 31 p. **DWB**—A catalogue listing and describing every fi taken by the Alaskan stations during IGY. All films are 16 mm and are 100 ft or less. F each roll a date coverage in universal time is given and a number assigned for ease in orderin Necessary data for inspecting each station's film are also included. Some additional descripti of each roll of film is given to assist the most desirable film selection at a minimum cost ar correspondence. *Subject Headings:* **1. IGY data 2. All-sky camera data 3. Alaska.**—*I.S.*

12.6–58 551.506.22:551.324.5(235.2)

Jangpangi, B. S. (*Geological Survey of India, Calcutta*), **Study of some of the centr Himalayan glaciers.** *Journal of Scientific and Industrial Research, Sec. A*, New Delhi, 17(12 Special Supplement, Dec. **1958.** p. 91–93. 5 refs. **DWB, DLC**—Brief summarized resul of the survey of the following glaciers as conducted during the IGY on behalf of the India Glaciological Subcommittee: Gangatri, Glacier No. III (Arwa Valley), Satopanth, Bhagirat Kharak, Miliam, Pating, Shunkalpa and Pindari. Geographic locations of each glacier ar the main characteristics are given. The glaciers of the central Himalayas are in retrea although minor advances may have occurred. Evidence for three stages of past glaciation discussed. Climatic conditions during the last three years are said to have been abnorma involving early and larger snowfalls. *Subject Headings:* **1. Glaciation in central Himalaya 2. Glacier investigations 3. Glacier variations 4. Central Himalayas.**—*W.N.*

Arctic—Antarctic

See also: **Stratospheric warming of Antarctic atmos.** (Alt), 12.6–311; **Effect of Arctic on meridional circulation** (Rafailova), 12.6–332; **Nebulosity variation of clouds, Dumont-d'Urville** (Chesneau), 12.6 383; **Microclimat. at Fletcher's Ice Island, T-3** (Larsson), 12.6–427; **Ellesmere Ice Shelf met. program** (Lotz), 12.6–428.

12.6–59 551.324.24:625.74(988)

Leighty, Robert D. and Poulin, Ambrose O., **Ice-cap access route, Narssarssuaq, Green land.** *U. S. Snow Ice and Permafrost Research Establishment, Technical Report*, 48, May **1960** 36 p. 60 figs., (incl. numerous photos), 3 tables. **DWB, DLC**—The location and surrounding of an overland route from the Narsarssuak Air Base to the ice cap are described and evaluated on the basis of a survey in the summer of 1957, with emphasis on engineering problems. The physical characteristics of the terrain, as determined from aerial photography and field re connaissance, and possible alternate routes are discussed; an engineering analysis of the entire route is given by section; and recommendations for continued study are made. The route is about 45 mi long and extends from the air base, which is near sea level, to an elevation of 3942 ft on the ice cap at the end of the route. The location established utilizes the natural terrain and materials About 95% of the grades will be 6% or less and none will exceed 10%. Two locations will require switchbacks because of steep slopes. The route is mostly over rocky terrain and will necessitate considerable blasting. Good sources of granular materials are available at many locations along the route. *Subject Headings:* **1. Ice caps 2. Roads on ice 3. Narsarssuak, Greenland.**—*Authors' abstract.*

12.6–60 551.511:551.551.8:551.326.7(98)

Iakovlev, G. N., **Turbulentnyĭ teploobmen ledianogo pokrova s vozdukhom v Tsentral'noĭ Arktike.** [Turbulent heat exchange between the ice cover and the air in the central Arctic.] *Problemy Arktiki*, Leningrad, No. 2:193–204, **1957.** 5 figs., 3 tables, 5 refs., 11 eqs. **DLC** (G600.P7)—The annual variations of the turbulent heat exchange at the North Pole and Turukhansk are compared. The turbulent heat flux for drifting ice has an annual variation; in the period from May to September the heat flux is directed from surface to air during the remaining time the flux is reversed. The heat flux from atmosphere to ice during polar night is greater than the upward heat flux during the light period. The turbulent heat exchange

between ice cover and atmosphere in the Arctic is negligible throughout the year and differs considerably from the exchange of a maritime climate but it approaches the character of exchange of the continental climate of the subarctic latitudes (Turukhansk). The data used here were developed from the data collected at drift station North Pole-2. The computations are derived from A. R. KONSTANTINOV's (1952) semi-empirical method. Daily, 10 day, and monthly sums of turbulent heat exchange are tabulated. The turbulent heat flux according to gradient data are calculated in cal/cm². *Subject Headings:* **1. Turbulent heat exchange 2. Ice drifts 3. Arctic Ocean.**—*E.Z.S.*

12.6–61 551.506.5(99)

*Sovetskaia Antarkticheskaia Ekspeditsiia, 1955 -, **Pervaia Kontinental'naia Ekspeditsiia, 1955–1957 gg.: Obshchee opisanie.** [First Continental Expedition, 1955–1957: General description.] Its [*Materialy*], Vol. 1, issued Leningrad, Izdatvo Morskoĭ Transport, **1959.** 211 p. 117 figs. (incl. photos), tables. At head of t-p.: Mezhdunarodnyĭ Geofizicheskiĭ God. Articheskiĭ i Antarkticheskiĭ Nauchno-Issledovatel'skiĭ Institut. Table of contents in Russian and in English. Also *Idem.*, **Pervaia Kontinental'naia Ekspeditsiia, 1955–1957 gg.: Nauchnye rezul'taty.** [Scientific results.] Its [*Materialy*] Vol. 2, issued **1959.** 161 p. figs., photos, tables, refs. Pertinent articles (abstracted separately): Rusin, N. P., **Nekotorye kharakhteristiki radiatsionnogo i teplovogo balansa v Vostochnoĭ Antarktide,** [Some characteristics of radiation and heat balance in East Antarctica], p. 39–45. Tauber, G. M., **Sinopticheskie usloviia indiĭskogo sektora Antarktiki,** [Synoptic conditions of the Indian sector of the Antarctic], p. 46–48. Tauber, G. M., **Kharakteristika meteorologicheskikh usloviĭ Antarktiki v 1956 g,** [Characteristics of meteorological conditions in the Antarctic in 1956], p. 49–54. Rusin, N. P., **Meteorologicheskaia kharakteristika raĭona observatorii Mirnyi,** [Meteorological characteristics of the Mirny Observatory region], p. 55–67. Gusev, A. M. and Rusin, N. P., **Meteorologicheskaia kharakteristika lednikovogo sklona Vostochnoĭ Antarktidy,** [Meteorological characteristics of the ice slope of East Antarctica], p. 68–72. Vtyrin, B. I.; Dolgushin, L. D.; Kapits, A. P. and Model, Iu. M., **Sovremennyĭ lednikovyĭ pokrov Vostochnoĭ Antarktidy i ego dinamika,** [Recent ice sheet of East Antarctica and dynamics], p. 73–92. Korotkevich, E. S.: **Ledovyĭ rezhim moria Deĭvisa i sosednikh raĭonov okeana,** [Ice regime of the Davis Sea and adjacent areas of the ocean], p. 93–103. Bukin, G. V., **Ionosfernye nabliudeniia,** [Ionospheric observations], p. 111–114. Sen'ko, P. K., **Magnitnoe pole v raĭone Mirnogo,** [Magnetic field in the Mirny area], p. 115–134. Sen'ko, P. K. and Troitskaia, V. A., **Issledovanie zemnykh tokov v raĭone Mirnogo,** [Earth current research in the Mirny area], p. 135–152. Sytinskiĭ, A. D., **Seĭsmicheskie nabliudeniia v Mirnom,** [Seismic observations in Mirny], p. 153–156. Paleev, N. R., **Meditsinskie issledovaniia v Vostochnoĭ Antarktide,** [Medical research in East Antarctica], p. 157–161. **DWB.** Also *Idem.*, **Pervaia Kontinental' naia Ekspeditsiia, 1955–1957 gg.: Materialy nabliudeniĭ.** [Observation data [on meteorology and actinometry, comp. by N. P. Rusin].] Its [*Materialy*] Vol. 3, issued **1959.** 459 p. Almost entirely tables. Also *Idem.*, **Pervaia Kontinental'naia Ekspeditsiia 1955–1957 gg.; Materialy nabliudeniĭ.** [Observational data [on aerology].] Its [*Materialy*] Vol. 4, **1959.** 482 p. Almost entirely tables. **DWB** (M82/99 K81pe), **DLC** (G860.S58)—These four volumes on the scientific results of the Soviet Antarctic Expedition which surveyed the portion of the continent and established the bases for the IGY 1957–58 program at the stations in the Soviet Sector, contains a volume describing the expedition and stations, one with a dozen articles analyzing meteorological, glaciological, geographical, geomagnetic, seismic, biological, medical and other data and conditions, and 2 volumes giving the basic data *in extenso.* In Vol. 3, the meteorological observations by N. P. RUSIN are summarized in seven extensive tables: 1) observations at fixed hours, 2) hourly thermograph readings, 3) hourly hygrograph readings, 4) hourly wind speeds, 5) meteorological observations at supplementary hours (04, 10, 16 and 22 h), 6) observations at advanced stations 1, 2, 3 and 4 and 7) monthly summaries. Pt. 2, on **Actinometry,** consists of two tables: 1) actinometric observations and 2) hourly radiation totals. Layout of station and equipment at Mirny, Pioneerskaya and Oazis, instruments, methods of compiling data and explanation of tables are set forth in the introduction. Data at 01. 07, 13 and 19 h include pressure, wind direction and speed, temp., absolute humidity, rel. humidity, saturation deficit, soil surface temp., upper and lower cloudiness and flow type, visibility and misc. phenomena. Data for Mirny run from Feb. 11, 1956, when the

station was established, to the end of Jan. 1957; for Pioneerskaya from May 1, 1956 throu Jan. 1957; for Oazis from Oct. 14, 1956 through Jan. 1957. Data for the two advanced static are not as comprehensive as for Mirny, and the hourly data are for a more limited period time than for the basic data. Data for three advanced stations include air and snow surfa temp., wind speed at 2 m and misc. phenomena for 01, 04, 07, 10, 13, 16, 19 and 22 h for At 1–18, 1956 (with breaks) and for Aug. 3–Sept. 30 for No. 4. Radiation data begin March 19 and run through Jan. 1957, and are given for 01, 07, 10, 13, 16 and 19 h at Mirny; from June 1956–Jan. 1957, at Pioneerskaya; Oct. 12–Jan. 31 at Oazis. Equipment at Mirny includes actinometer, pyranometer, albedometer and a radiation balance meter; at Pioneerskaia pyranometer, albedometer and balance meter and at Oazis a pyranometer. Aerological data Vol. 4 are very complete, the 9 tables giving detailed temp.-wind soundings, pibal and rad wind observations, the mean pressure, wind speed and frequency of wind directions to 20 k from Feb. 12, 1956 through Jan. 1957, for Mirny; Nov. 24, 1956–Jan. 15, 1957, at Pioneerskai on a tractor expedition from April 4, to May 10, 1956; on the "Lena" from Dec. 29, 1955 Jan. 18, 1956 and on the "Kooperatsiia" from Feb. 16 to March 24, 1957, and from advance station No. 4 from Aug. 5–6, 1956. The first volume describes and illustrates with some det the shipping of material and personnel, choosing the site for Mirny, unloading, constructio administration, surveying and supplying by air, organization of the four main groups (aer meteorological, geophysical, aerophotogrammetric and geological-geographical, the scienti equipment of each, the observations and compilation of data, the Pioneerskaya static (69°44′02″S, 95°30′E, 3000 m alt.) and its construction and work (meteorological, aerologic and glaciological), the Oazis station (on the shore of Lake Figurno, 66°16′S, 100°45′E). T field work in all disciplines, a diary of the expeditions from Nov. 18, 1955 to April 5, 195 and a list of personnel by categories of work and duties are also included. The subjects covere in Vol. 2 can be seen clearly from the titles of the articles as given above. A great deal selected or summarized data and illustrative material are included in this volume as in Vol. *Subject Headings:* **1. Soviet Antarctic Expedition #1, 1955–1957 2. Meteorological da summaries—Soviet Antarctic stations 3. Mirny, Antarctica 4. Pioneerskaya, Antarctic 5. Oazis, Antarctica. I. Akademiia Nauk SSSR, Kompleksnaia Antarkticheskaia Ekspeditsii see Sovetskaia Antarkticheskaia Ekspeditsiia, 1955– II. Somov, Mikhail M.** (*ed.*) **III. Tau ber, G. M.** (*ed.*) **IV. N. P. Rusin.**—*M.R.*

12.6–62 919.9(99

Euller, John, **Antarctic world.** London, Abelard-Schuman, **1960.** 222 p. 29 photos 18 figs. **DLC** (G860.ES)—A geography of Antarctica based on the information accumulate by various scientific groups. Descriptions are given of several expeditions of discovery an exploration from the voyages of Cook to those now in progress. Operation Deepfreeze an the IGY program are explained. The elements of the Antarctic environment, weather an landscape, as far as current information provides, are described in a careful and detailed manne so that interested readers may form a vivid picture of the natural environment and the diffi culties involved in scientific studies there. The results of geophysical investigations are ex plained and their significant contributions to earth science are pointed out. *Subject Headings* **1. Geography of Antarctica 2. Antarctica.**—*E.Z.S.*

12.6–63 551.5:550.3(99

Evison, F. F.; Ingham, C. E. and Orr, R. H. (*all, New Zealand Dept. of Sci. & Ind. Res.*) **Antarctic notes.** *American Geophysical Union, Transactions*, 40(3):296–299, Sept. **1959** 3 figs. "Full report in *Nature*, Jan. 31, 1959." **DWB**—Belief in the existence of continen type crustal structure beneath the ice mantle of a large portion of East Antarctica is based on seismological interpretations. The Executive Committee Ranges (preliminary studies) are volcanic in origin. Alpine-type valley glaciers flow from the peaks to join the vast ice shee of Marie Byrd Land. The position of IGY Amundsen-Scott South Pole Station was indicated as 89°59′43.6″±0.7″S lat., 24.8°±2.4°W long. Two firnquakes were experienced during the third leg of the 1957–1958 Byrd Station traverse. Work is under way at John Hopkins Univ. and N. I. H. on samples of blood sera, virus cultures and bacterial cultures taken from personne in or en route to and from Antarctica. Isolated communities usually remain free from colds

until visited by new people, hence an ideal situation exists for a controlled testing program to study the causes and spread of the common cold. *Subject Headings:* **1. Antarctic research 2. Antarctica. I. Orr, R. H.**—*E.Z.S.*

12.6–64 551.506.22 551.509.317(99)

Soviet Antarctic station. *Science*, Wash., D. C., 127(3306):1107, May 9, **1958. DLC** – Brief report on life and activities at the Soviet Antarctic IGY station at Mirny, 93°E long. as experienced by the only American among more than 100 Russian members of the expedition (1956–1958). C. D. CARTWRIGHT, an assignee on the U.S.-U.S.S.R. scientific exchange program, was responsible for the preparation of daily upper air charts covering the bulk of the Southern Hemisphere. Reliable weather charts of the South Polar regions were made. Cloud photography included time-lapse of cloud formations. The station, located at an elevation of 12,000 ft, suffered from the "height and cold barrier" and the soft snow. *Subject Headings:* **1. IGY Antarctic stations 2. Mirny, Antarctica.**—*W.N.*

12.6–65 551.506.22:91.04(98,99)

Riabinin, Aleksandr Konstantinovich, **Iz Arktiki v Antarktiku; putevye dnevniki.** [From the Arctic to the Antarctic: log of voyages.] Ed. by A. Fedotovskiĭ. Murmansk, Murmanskoe Knizhnoe, **1959.** 253 p. 23 illus. **DLC** (G590.R5)—A readable transcription in book form of the diaries or logs of the Soviet ship "Kooperatsiia" on its first voyage from Oct. 3, 1956 to April 5, 1957 en route from Arkhangelsk to Mirny and return to the U.S.S.R. and from Nov. 1, 1957 to April 13, 1958 on a return trip to Mirny from Kaliningrad, in the interests of supply operations for the Soviet IGY station in the Antarctic. Many details of the scientific work of the ship, and work at the base are narrated. *Subject Headings:* **1. Antarctic IGY supply operations 2. Soviet Antarctic expeditions.**—*M.R.*

12.6–66 91.04(99)

La Croix, Robert de, **Conquerors of the Antarctic.** Translated from the French by Edward Fitzgerald. London, F. Muller, **1958.** 268 p. 16 illus. **DLC** (G870.L313). Transl. of orig. French, **Les conquérants de l'Antarctique.** Paris **1956.** 259 p. **DLC** (G870.L3)—A narrative account of the discovery and early exploration of Antarctica. The account begins with the discovery of the South Shetlands by Capt. Smith in 1819, and includes subsequent discoveries and exploration up to and including that of Admiral Byrd in Operation High Jump. Descriptions of sea and weather conditions are incidental to the personal accounts of the hardships involved in the sea voyages, and land exploration. The contributions of COOK, DUMONT D'URVILLE, ROSS, GERLACHE, CHARCOT, SCOTT, SHACKLETON, AMUNDSEN, SCOTT, MAWSON, NORDENSKJÖLD, WEDDELL, NANSEN, WILKINS, BYRD and others are described. *Subject Headings:* **1. Antarctic expeditions 2. Antarctic exploration 3. Antarctica. I. Fitzgerald, Edward** (*transl.*).—*E.Z.S.*

12.6–67 551.506.22:551.501.9(99)

Nudel'man, A. V., **V raion iuzhnogo poliusa otnositel'noĭ nedostupnosti.** [Region of relative inaccessibility of the South Pole.] *Akademiia Nauk SSSR. Mezhduvedometvennyĭ Komitet po Provedeniiu MGG (IGY). Informatsionnyĭ Biulleten*, No. 5:86–90, **1958.** fig. **DWB**—A detailed account of the establishment of the continental station Sovetskaia at the pole of relative inaccessibility in 1957 during the third Antarctic expedition headed by E. I. TOLSTIKOV. The means of transportation (caterpillar tractors, sleds), preparations for departure, the preliminary exploratory flight, including its course, and the terrain observed are described. The personnel engaged both in the flight and the expedition are listed. The actual course of the expedition to its destinations, 78°24′S lat. and 87°35′E long. where it arrived on Feb. 10, 1957 and the establishment of Sovetskaia station are described. A map showing the area of operation of the Soviet interdisciplinary Antarctic expedition is presented and data on atmospheric temperatures are given in the text. *Subject Headings:* **1. Soviet IGY Antarctic expeditions 2. Antarctic meteorology stations 3. Pole of relative inaccessibility 4. Sovetskaia, Antarctica.**—*I.L.D.*

A7. CONFERENCES—SYMPOSIA

12.6–68 551.508.952:061.3 551.510.534:061

International Union of Geodesy and Geophysics [and] World Meteorological Organiz tion, **Summaries of papers presented to the IUGG/WMO Ozone Symposium, Oxford, Ju 1959.** Cover letter, June 9, **1959.** Summaries of 44 papers referred to in an accompanyi listing plus two additional papers (all unpaged). Mimeo. **DWB** (M10.534 111su). S *WMO Bulletin*, 8(4):201, Oct. **1959** for details of **Symposium,** which was preceded July 17– by meeting of Working Group on Atmospheric Ozone of the WMO Commission for Aerolog and followed July 27–28 by meeting of Working Group on Radiation Measurements of t WMO Committee for Instruments and Methods of Observations. **DWB**—A collection of t preliminary papers sent to the participants in Ozone and Radiation Symposia, concerning t proposed Symposium On Atmospheric Ozone in Oxford, between July 20–25, 1959. The papers give the time-table for the Symposium and the provisional program. The chief featu of this publication, however, is the summaries of the 44 papers referred to in the provision program, a few of which are graphically illustrated. These summaries may be classified in following groups: papers dealing with: 1. vertical distribution of ozone from radiosondes ar aeroplanes; 2. vertical distribution of ozone from Umkher measurements; 3. relations of ozo with upper air data in Polar regions and elsewhere and some IGY results; 4. ozone instrument 5. worldwide variations in vertical distributions of ozone and the relations with stratospher circulation and 6. infra-red observations of ozone. *Subject Headings:* **1. Vertical ozone di tribution 2. Ozone meters 3. Ozone symposia.**—*I.S.*

12.6–69 551.587(234.42):061

Steinhauser, F. (*Vienna*), **Erstes Symposion über die Meteorologie und Klimatologie d Karpaten.** [First symposium on the meteorology and climatology of the Carpathian Mou tains.] *Wetter und Leben*, Vienna, 12(1/2):20–22, **1960. DLC**—A report on the symposiu on problems of the meteorology and climatology of the Carpathian Mountains that was hel during Sept. 29–Oct. 1, 1959 in Smolenice, the home of the Slovak Academy of Science Nineteen papers were delivered; some of these are summarized briefly. F. STEINHAUSE compared temperature, humidity and wind observations in the High Tatra with similar ob servations from the East Alps and the free atmosphere over Vienna. G. PÉCZELY discussed th influence of the Carpathian Mountains on the atmospheric flow over Hungary. N. KONČE considered the effects of different weather situations on the weather of the southern slopes o the High Tatra. Papers were presented on the precipitation conditions including its de pendence upon elevation above sea level (V.BREEDON), meteorological and climatologica conditions associated with occurrence of avalanches in Czechoslovakia (L. KNUZOVICKY) statistical studies on free föhn at the Lomnic Observatory, etc. *Subject Headings:* **1. Uppe air climatology 2. Climatological symposia 3. Carpathian Mountains.**—*I.L.D.*

12.6–70 550.382.3:551.24

Royal Astronomical Society, **Geophysical discussion on continental drift, Nov. 27, 1959** *Geophysical Journal*, London, 3(1):127–132, March **1960. DWB, DLC**—A report on a discus sion held Nov. 27, 1959 at Royal Astronomical Society on the subject of continental drift T. F. GASKELL pointed out that the seismic measurements demonstrated that the geologica structure beneath the oceans differs from that under the continents and that the ocean basin never had been continents: S. K. RUNCORN spoke on rock magnetism as evidence of continenta drift. O. T. JONES discussed glaciation and pole movement. N. L. FALCOLN reviewed tea faults and sedimentary studies that supported continental drift. W. B. HARLAND spoke o Tillites and J. D. BERNAL offered oceanographic data in support of continental drift. *Subjec Headings:* **1. Continental drift 2. Paleomagnetism.**—*E.Z.S.*

12.6–71 551.510(08)

National Academy of Sciences, Wash., D. C., **Symposium on Physics, Chemistry and Biology of the Atmosphere, Wash., D. C., April 27, 1959.** Proceedings issued in its *Proceedings* 45(12):1649–1696, Dec. **1959.** figs., tables, refs. (All articles abstracted separately.) **DLC**—

Four papers read before the Academy on April 27, 1959, showing that the atmosphere in its structure and behavior poses problems to be approached from a variety of scientific backgrounds. These papers are preceded by the introductory remarks made by the chairman in which he comments on the four papers. *Subject Headings:* **1. Atmospheric structure 2. Meteorological symposia.**—*I.S.*

A8. SERVICES—INSTITUTIONS

12.6–72 551.501.9:551.509:551.507.362.1

aufm Kampe, H. J. (*U. S. Army Sig. Res., Fort Monmouth, N. J.*), **Meteorological rocket network for measuring atmospheric parameters up to 250,000.** *Weatherwise*, Boston, 13(5): 192–195, Oct. **1960.** 7 figs., ref. **DWB** –An account is given of the meteorological rocket network established by the U. S. Signal Corps with the cooperation of the Air Weather Service and the Weather Bureau. The stations are situated at different places on the North American continent. The main aim of the network is to obtain synoptic upper air data and investigate special features of dynamics and thermodynamics of the layer between 100–250 thousand ft. *Subject Headings:* **1. Meteorological rocket networks 2. Rocket observations.**—*A.H.K.*

12.6–73 551.579:06(47)

Nekhotizeva, O. V., **Gidrometeorologicheskaia sluzhba v SSSR.** [Hydrometeorological service in the U.S.S.R.] Moscow, Gos. Izd-vo Sel'khoz. Lit-ry, **1958.** 22 p. 9 figs. **DLC** (QC875.R9N4)—A small pamphlet describing and illustrating the activities of the hydrometeorological service in the U.S.S.R., especially that for agricultural meteorology and hydrology, reclamation, etc. and the work on the Arctic pack-ice (SP4 and SP5 expeditions). *Subject Headings:* **1. Soviet Hydrometeorological Service 2. Agricultural meteorology.**—*M.R.*

12.6–74 551.506.22:551.579:061.1(477)

Prikhot'ko, G. F., **Uchastie UkrNIGMI v Mezhdunarodnom geofizicheskom godu.** [Participation of the Ukrainian Hydrometeorological Scientific Research Institute in the IGY.] *U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoi Sluzhby. Komitet po Provedeniiu Mezhdunarodnogo Geofizicheskogo Goda, Informatsionnyĭ Sbornik*, No. 4:97–98, **1957. DWB**—The principal work of the Ukrainian Hydrometeorological Research Institute in connection with the IGY as carried out at the experimental base of the institute, namely the Kiev-Bagrinava Gora agrometeorological station. The work of the station includes actinometry, meteorology, evaporation from water surface and soil and atmospheric electricity. In addition to studies of all the factors of the radiation regime, studies have been made (since 1950) of the spectral composition of radiation (observations in the orange and red regions of direct radiation) and since 1957, on the infrared and yellow regions. The observations on atmospheric electricity include potential gradient of the electric field with the aid of an electrograph, intensity of the electric field at the earth's surface and in the free atmosphere (using an airplane) and currents from points, studies are also being conducted on the general atmospheric circulation and on the heat balance of the surface of the earth in connection with the general circulation and atmospheric turbulence. *Subject Headings:* **1. Ukrainian Hydrometeorological Research Institute program 2. IGY program.**—*I.L.D.*

12.6–75 551.501.9(899)

Avegno, Carlos Alberto, **Red de observadores.** [Observers network.] *Revista Orientación Meteorológica*, Montevideo, No. 8:29–31, Sept. **1955. DWB, DPU**—Plans for reorganization of the observers network and a note expressing appreciation for the cooperation of the participants. *Subject Headings:* **1. Observational networks 2. Montevideo, Uruguay.** —*E.Z.S.*

12.7–76 5:061.3

Berkner, Lloyd V. (*Pres., Internat. Council of Sci. Unions*), **International collaboration in science.** *International Council of Scientific Unions, ICSU Review*, 1(1):6–15, Jan. **1959. DWB**—An address given before the final evening session of the Second United Nations Inter-

national Conference on the Peaceful Uses of Atomic Energy, Geneva, Sept. 12, 1958. T fundamental principles of global scientific collaboration, aspects of this cooperation in pla and deeds, and future development within this framework in days ahead are stated. *Subj Headings:* **1. International Council of Scientific Unions (ICSU) 2. International cooperat in science.**—*W.N.*

12.6–77 551.5:061.1(7

Atmospheric Research Center. *Physics Today*, N. Y., 13(9):62–64, Sept. **1960. DWE** Alan T. Waterman, Director of the National Science Foundation, together with Henry Houghton, announced the creation of a national center of atmospheric research which is serve as the administrative headquarters for the coordination of a major national weath research program. Research programs to be undertaken will probably be concerned wi atmospheric motions and with energy exchange processes, water substance, and physi phenomena in the atmosphere. Research will be in part in collaboration with Universi groups. *Subject Headings:* **1. Meteorological research institutes 2. United States.**—*E.Z.S*

12.6–78 551.5:061.1(5

Tokyo. Meteorological Research Institute, **Brief of the Meteorological Research I stitute.** Tokyo, March **1955.** 11 p. 3 photos. Publications of staff members, p. 8–1 **DWB** (M(06) M589br)—This report presents a brief history of the Tokyo Meteorologic Research Institute, organized in January 1942. As a part of its program, the institute undc takes research on the physics of cloud and precipitation, on atmospheric turbulence, on a mospherics and on lightning discharges and ocean waves, as well as on other oceanographic and meteorological projects. *Subject Headings:* **1. Meteorological research institut 2. Tokyo, Japan.**—*N.N.*

12.6–79 551.5:550.3:061.1(7

U. S. National Science Foundation, **9th Annual Report, 1959.** Issued Wash., D. C., 196 274 p. figs., photos. **DWB** (507.2 U583r)—National Science Foundation supported activiti in such fields as radioastronomy, stratospheric balloon (stratoscope), observatories for sunspot auroral research, rocket launchings, astronomical observatories, Antarctic research duri IGY, information services, etc. are reviewed and illustrated, and grants listed, IGY gran enumerated by subject, etc. *Subject Headings:* **1. National Science Foundation 2. IG research grants.**—*M.R.*

A9. EDUCATION—HISTORY—BIOGRAPHY—BIBLIOGRAPHY

History

See also: **Hist. of met. obs. in Siberia** (Smoliakov), 12.6–22; **Theories of circulation of earth's atmos.** (Sutton), 12.6–333; **Hist. of snow surveying in the East** (Ayer), 12.6–400.

12.6–80 551.582.1(47

Popova, K. I., **Pervaia monografiia o klimate Rossii.** [The first monograph on th climate of Russia.] *Meteorologiia i Gidrologiia*, Moscow, No. 4:53–55, April **1960. DWE DLC**—The author presents an analysis and an evaluation of Konstantin Stepanovic Veselovskii's monograph **O klimate Rossii** [The climate of Russia] which was published i Petersburg (now Leningrad), in **1857** and which was the first study of the climate of Russia The author utilized all available material on the climate of Russia; these included meteorc logical observations since the second half of the 18th century in Petersburg, Moscow and variou points in Finland, material of various expeditions, etc. The climatic analysis was based upo 121 points in European Russia and 26 points in Asian Russia. The monograph consists o five chapters: **Heat, Wind, Atmospheric humidity, Hydrometeors, Thunderstorms and A examination of the problem of the change of climate in Russia during historic time.** A con siderable part of the work is devoted to the characteristics of incoming and outgoing radiatio energy, atmospheric temperature and thawing and freezing of rivers and lakes. The autho

considered the distribution of spring and winter frosts and explained the origin of cold weather by the spread of cold waves from northwest to the southeast and radiation of heat from the earth's surface. VESELOVSKII introduced a series of new indices for characterizing climate; the sum of temperature above a given level for explaining the most suitable climates for various crops, etc. He was the first to study the interannual variation of climate and temperature. He determined three wind zones within the confines of Russia: the northern zone and prevailing west and northwest winds; a southern (steppe zone) with prevailing east winds and a middle transitional zone. VESELOVSKII explained the sukhovei winds of the steppe by relating them to the prevailing east and north air currents and regarded them as of local origin. This monograph contains the first map of the distribution of precipitation in Russia and a discussion of the causes of cloud formation, convective precipitation, etc. VESELOVSKII concluded that the climate had not changed during historic times. *Subject Headings:* **1. Climate of Russia 2. Historic climates 3. U.S.S.R. I. Veselovskiĭ, Konstantin Stepanovich.**—*I.L.D.*

12.6–81 52(09) 521(082)

Michel, Henri, **Pages immortelles: Copernic, Galilée, Kepler.** [Immortal pages: Copernicus, Galilei, Kepler.] *Ciel et Terre*, Brussels, 75(11/12):342–358, Nov./Dec. **1959.** 2 foot-refs. **DWB, DLC**—The reproduction in French of some excerpts from the works of COPERNICUS, GALILEI and KEPLER gives an idea of the atmosphere in which the big discoveries were published. Among these, some have been differently presented as simple work hypotheses, others were triumphantly and loudly announced. The different quotations are accompanied by a short commentary. First are reproduced abstracts from COPERNICUS's work entitled **De Revolutionibus Orbium Coelestium** (1543), then passages from GALILEI's **Sidereus Nuncius** (1610). COPERNICUS condensed in his book his complete conception of the solar system and GALILEI relates in a few pages of his work the sensational discoveries of the first observations by telescope. The latter announced certain of his observations or discoveries in cryptogram form, the explanation of which was only given later. In this paper, the author reproduces 4 cryptograms; the deciphering of one of these was: "The mother of love competes with Diana's shapes" which means that Venus has the same phases as the Moon. This text brought evidence of the movement of Venus around the Sun and constituted the first step in the objective demonstration of the heliocentric system. The end of the article is devoted to KEPLER. It is difficult to give a precise date for Kepler's laws as they are scattered throughout large volumes which summarize 25 years of research. *Subject Headings:* **1. History of astronomy 2. Theoretical astronomy 3. Celestial mechanics 4. Copernicus, Nicolaus 5. Galilei, Galileo 6. Kepler, Johannes.**—*A.V.*

12.6–82 551.5:061.1(73)

†Kvam, Ernest L., **Evolution of the U. S. Weather Bureau in meeting the needs of radically changing times.** June **1960.** 126 p. 8 figs., numerous foot-refs., 63 refs. (in bibliog.). Thesis (M.A.)-George Washington Univ., Wash., D. C. **DWB** (M:350 K97ev)—The major events and influences in the evolution process of the agency, its form of organization, and its service programs are described based on primary source material. The study shows that the evolution of the Weather Bureau is not merely a process of the evolution of an organization and its service programs but rather, the evolution of the entire science of meteorology from a level of scientific curiosity to a full fledged and highly respected science. *Subject Headings:* **1. History of U. S. Weather Bureau 2. U. S. Weather Bureau.**—*I.S.*

BIOGRAPHY

See also: **Conquerors of the Antarctic** (La Croix), 12.5–66; **Biog. of Copernicus, Galilei and Kepler** (Michel), 12.6–81.

12.6–83 550.34:92

Landsberg, H. E., [**Obituary of**] **Beno Gutenberg, 1889–1960.** *American Meteorological Society, Bulletin*, 41(5):278;287, May **1960. DWB**—GUTENBERG's contributions to the development of geophysics in general, and to that of seismology in particular, are appraised.

His dissertation prepared at the University of Goettingen, represented the first comprehensive treatment of microseisms. He developed the first application of seismological techniques to warfare, namely the soundranging for large guns, during his service in the German Army during World War I. The study of the structure of the high atmosphere arose from his investigations stimulated by the large artificial explosions of surplus ammunition in the early postwar period. Some of his early analyses of anomalous sounds clearly demonstrated the existence of warm layers in the stratosphere long before these could be explored by direct measurements. A multi-volume handbook on geophysics edited by him, during his professorship at the University of Frankfurt, represented the most important text and reference books in this field for many years. His original work on the structure of the earth by analysis of seismic waves led to an invitation for a lecture trip to the United States. In 1930 he received a permanent appointment to a professorship at the California Institute of Technology and in 1947 he became director of the Seismical Laboratory at Pasadena. This was the beginning of an exceptionally creative period culminating in a classical book on the structure of the interior of the earth and in a basic reference work on the seismicity of the earth, the latter with C. F. RICHTER as joint author. He also taught courses on the upper atmosphere to Air Corps cadets during World War II. His membership on the seismology panel of the Research and Development Board of the Dept. of Defense in the post-war period was marked by the development of techniques for the detection of nuclear explosions. He was president of the International Association of Seismology and Physics of the Earth (1951–1954) and of the Seismological Society of America (1945–1947). He served also as associate editor of the *Journal of Meteorology* from 1947 to 1954. *Subject Headings:* **1. Obituary of Beno Gutenberg 2. Seismology 3. Gutenberg, Beno.**—*O.T.*

BIBLIOGRAPHY—TERMINOLOGY

12.6–84 551.588.6:016

†U. S. Forest Service, **Forest and range influences publications, 1956–1957.** Aug. **1958.** 19 p. refs. 901–1012. Mimeo. "Brings up to date a similar list compiled in May 1956 . . . for years 1905 to 1955." (*See* 9.4–54, April 1953, *Met. Abs.*)—A list of 112 unannotated publications arranged alphabetically by author. Subjects include watersheds, soil, shelterbelts, forest research, etc. *Subject Headings:* **1. Bibliography of forest influences 2. Forest influences.**—*A.J.M.*

12.6–85 551.582:016(479)

†Zikeev, Nina (Stepanova), **Annotated bibliography of the climate of the Caucasus.** Wash., D. C., U. S. Weather Bureau, Dec. **1960.** 43 p. 134 annotated refs. **DWB** (M(016) U587bcc)—References are alphabetically arranged with an author and a detailed subject index at the end. A chronological index indicates that the material dates from 1866 to 1960. Most of the articles are in Russian, original titles and complete references to serials, etc. are given. Annotations are as a rule brief and to the point. *Subject Headings:* **1. Bibliography on climate of the Caucasus 2. Climate of the Caucasus 3. Caucasus Region, U.S.S.R.**—*M.R.*

12.6–86 551.579:001.4

Spengler, O. A., **O gidrologicheskoĭ terminologii.** [Hydrological terminology.] *Vsesoiuznyĭ Gidrologicheskiĭ S"ezd, Trudy* (of 3rd Conference, Oct. 1957), Vol. 7, issued **1959.** p. 18–22. **DWB** (M79 V985tr)—The necessity of exact hydrological terminology is stressed and a short, critical survey of national and international (UN) efforts in this field is given. Special attention is paid to the East German DIN standards. The first draft of a new Soviet "Collection of Definitions of Basic Hydrological Terms and Concepts," is described. It has 14 sections: 1) general concepts; 2) hydrography; 3) rivers; 4) lakes and reservoirs; 5) swamps; 6) underground water; 7) hydrometry; 8) hydrological instruments; 9) hydrophysics subdivided into snow, ice and evaporation; 10) runoff and its computation; 11) hydrological forecasting; 12) waves; 13) channel formation; 14) water balance. The collection is said to contain 600 definitions. *Subject Heading:* **1. Hydrologic terminology.**—*J. Němec.*

B. APPLICATIONS

B1. AERONAUTICS

See also: **Structure of atmos. turbulence causing bumpiness in flight** (Kurilova, Khachatrian), 12.6–356; **Horizontal visibility under low clouds** (Fremming), 12.6–442.

12.6 87 551.5:629.13

Zimmerschied, W., **Dreidimensionale Analyse und meteorologische Navigation.** [Three dimensional analysis and meteorological navigation.] Frankfurt a.M., Akademische Verlagsgesellschaft, **1959.** 154 p. 64 figs., tables, numerous eqs. (*Luftfahrt-Meteorologie*, Ed. by H. Regula and W. Zimmerschied, Vol. 2.) **DWB** (M:629.13 L949Lu)—Three dimensional meteorology considered for long distance or high altitude pilots. The analysis of weather situations deals with altitude weather charts, three dimensional circulation; cyclones and anticyclones; structure of fronts; weather phenomena in a homogeneous air mass; jet stream. The section of weather forecast includes displacement of fronts, pressure change regions, construction of forecast charts and problems of forecasting. Meteorological navigation and the related problems of cartography, as map projections, are treated in the remaining sections. The appendices contain an example of a jet stream flight between 1800 and 2200 GMT, weather charts of relative and absolute topography, a flight report on Hurricane "Ione," and determination of the altitude of chief isobar surfaces by aircraft reports. *Subject Heading:* **1. Meteorological navigation for airplane pilots.**—*O.T.*

12.6–88 551.557:551.524.7:629.13:621.438

Phillpot, H. R., **Turbojet aircraft performance characteristics and their meteorological implications for Australian air route conditions.** *Australia. Bureau of Meteorology, Project Report* 59/2630, **1959.** 23 p. 9 figs., 2 tables, 13 refs. **DWB** (M(055) A938pr). Summary in *Australian Meteorological Magazine*, Melbourne, No. 25:86–87, June **1959. DWB**—An attempt is made to set down some of the physical principles on which the operation of the civil turbojet aircraft is based, and particularly as far as they concern the meteorologist. The forecasting of upper winds and temperatures is discussed and some statistical meteorological data for the Sydney-Darwin and Sydney-Nandi Sectors are given. The significance of errors in forecasting winds and temperatures on cruise is pointed out, with emphasis placed on forecasting terminal conditions. Temperature cross sections for Sydney to Singapore and Sydney to San Francisco are included. *Subject Headings:* **1. Turbojet aircraft 2. Upper air wind forecasting 3. Temperature forecasting 4. Airways meteorology 5. Australia.**—*E.Z.S.*

12.6–89 551.547:629.13

Laroque, J. (*Météorologie Nationale, Paris*), **Esquisse des routes aériennes intercontinentales de l'hémisphère Sud.** [Draft of the intercontinental air routes in the Southern Hemisphere.] *La Météorologie*, Paris, Ser. 4, No. 57:219–226, Jan./March **1960.** 3 figs., 3 tables. French, English, Spanish and Russian summaries p. 219. **DWB**—General considerations on the intercontinental air routes in the Southern Hemisphere, including study of these routes through a concrete example of the mean topography of the 300 mb isobaric surface during August 1958 and examination of the number of accidents and the evolution of 300 mb pressure surface through the year 1958. *Subject Headings:* **1. Aeronautical meteorology 2. Intercontinental air routes 3. High altitude flying conditions 4. Upper air topography.**—*Author's abstract.*

12.6–90 551.574.42:551.575.1

Thompson, F. D., **The effect of hoar frost on fog formation and dissipation at Malton airport.** *Canada. Meteorological Branch, CIR*-3160, TEC-293, Feb. 11, **1959.** 3 p. fig., 3 tables. ref. **DWB, DLC**—Describes a fog recorded at Malton Airport, Canada, on 20 and 21 Oct., 1958. On that day a sharp rise in dew point was recorded in the morning reaching 45°F but it reduced to 36°F by noon. By nightfall a heavy hoar frost covered the ground. On the second night ground was covered with dew and the addition of moisture to the air was not so sharp and the dew point dropped again. Fog forecasting is difficult at Malton due to air drainage. *Subject Headings:* **1. Hoar frost effect on fog formation 2. Fog formation 3. Fog dissipation 4. Malton Airport, Toronto, Canada.**—*A.H.K.*

12.6–91 551.508.59

Morasca, N., **Anemografo per la registrazione della componente del vento normale alla pista.** [Anemograph for recording wind components normal to a runway.] *Rivista di Meteorologia Aeronautica*, Rome, 20(3):39–40, July/Sept. **1960.** 2 figs. Italian, French, English and German summaries p. 39. **DLC**—The utility of an anemograph with a "pitot" enclosed in a tube normal to the direction of the runway is here described and illustrated in its original version. Variants of the device are also described, i.e., a twin-component anemograph and a remote electrical component indicator. *Subject Headings:* **1. Anemographs 2. Wind component recording.**—*Author's abstract.*

12.6–92 551.557:551.542.1:551.509.25

Lumb, F. E., **A quick method of allowing for trajectory curvature when estimating the gradient wind from forecast contour charts for westbound North Atlantic flights.** *Meteorological Magazine*, London, 88(1047):262–266, Oct. **1959.** fig., 4 refs., 13 eqs. **DWB, DLC**—The speed of movement of the contour patterns will determine whether the geostrophic wind or the approximate form of the gradient is a better approximation to the true gradient wind. The present paper first examines this question theoretically. Then the practical application of the theory to the task of drawing isotachs on forecast-contour charts for westbound North Atlantic flights is considered, Finally, the operationally important case of east winds on the north side of an upper low is discussed and graphically represented. *Subject Headings:* **1. Forecast contour charts 2. Flight forecasts.**—*I.S.*

12.6–93 551.507.352 533.6:629.13

Stillwell, Wendell H. and Larson, Terry J. (*both, Flight Research Center, Edwards, Calif.*), **Measurement of the maximum speed attained by the X-15 airplane powered with interim rocket engines.** *U. S. National Aeronautics and Space Administration, Technical Note* D-615, Sept., **1960.** 14 p. 6 figs., table, 8 refs. Also their: **Measurement of the maximum altitude attained by the X-15 airplane powered with interim rocket engines.** *Ibid., Technical Note* D-623, Oct. **1960.** 12 p. 5 figs., 8 refs. **DWB, DLC**—On Aug. 4, 1960, a flight was made with the X-15 airplane to the maximum speed expected with the interim rocket engines. Fully corrected airspeed measurements showed that the maximum Mach number of 3.31 ± 0.04 and maximum true airspeed of 2,196 mph ±35 were attained at an altitude of 69,000 ft. At Mach numbers greater than 2.0 the pitot-static tube exhibited a negative static-pressure error which resulted in a Mach number correction of -0.18 at the maximum speed. On August 12, 1960, an X-15 flight was made to achieve essentially the maximum altitude expected to be possible with the interim rocket engines. Presented are the details of the techniques utilized to determine the maximum geometric altitude of this flight (136,500 ft ±600). *Subject Headings:* **1. X-15 airplane speed 2. X-15 airplane altitude 3. Interim rocket engines.**—*Authors' abstracts.*

12.6–94 551.5:629.13

Meteorological practice in aircraft carriers. *Marine Observer*, London, 29(183):25–27, Jan. **1959. DWB, DLC**—Weather factors that affect naval aircraft operation from carriers and the complications in the launching and recovery at sea as well as the necessary forecasting are reviewed. Results obtained from radar balloon observations of upper winds are discussed. *Subject Headings:* **1. Aeronautical meteorology 2. Aircraft carriers.**—*N.N.*

B2. ASTRONAUTICS

See also: **Met. rocket network** (aufm Kampe), 12.6–72; **Ionization distribution in the F2 region** (Martyn), 12.6–177; **Solar origin of the outer zone of trapped radiation,** 12.6–203.

12.6–95 523.165:523.74:629.19

Lear, J., **Solar storms and space travel** *The New Scientist*, London, 8(205):1060, Oct. 20, **1960. DLC**—This note gives a summarized account of a paper read to a U. S. Air Force symposium in San Diego by D. H. Robey. The solar wind in space is convulsed periodically by gusts originating from solar storms. These are graded in intensity from 1–4. To protect

the inhabitants of a space ship from gusts due to class 4 storms would require a protective covering of seven feet thickness of solid carbon which would make the vehicle too heavy. As class 4 storms are rare it would be reasonable to chance not allowing for them. To give protection from class 3+ storms would require a carbon thickness of less than 2 in. and this should be possible. However a continued study of the nature of these gusts and methods of predicting them will probably enable more sophisticated protection procedures to be devised. *Subject Headings:* **1. Astronautics 2. Solar wind 3. Solar storms.**—*R.B.* Ⓢ

12.6–96 551.507.362.2

Bandeen, William R. (*N. A. S. A., Wash., D. C.*) and Manger, Warren P. (*R. C. A., Princeton, N. J.*), **Angular motion of the spin axis of the Tiros I meteorological satellite due to magnetic and gravitational torques.** *Journal of Geophysical Research*, Wash., D. C., 65(9): 2992 2995, Sept. **1960.** 2 figs., ref., 2 eqs. **DLC**—Several days after launching Tiros I, April 1, 1960, the moving of the spin-vector 3° to 5° per day became apparent, reaching its southernmost declination −30° and its RA (right ascension) increasing to +69.0° on April 23, from the initial values of +19.8° and of 58.6°, respectively. Then the spin-vector started moving in the opposite direction at a greater rate. Owing to a torque exerted on the orbit by the earth's bulge, the orbit regresses (westward) around the equator 4.547° per day. An investigation of a magnetic couple as the apparent primary force indicated a primary torque caused by the interaction of a magnetic dipole along the satellite spin axis with the earth's magnetic field and a secondary torque by differential gravity in the earth's gravitational field. An equation of motion with parameters of Tiros I programmed on an electronic computer using the initial conditions of Tiros I showed excellent agreement with the observed motion of the spin axis. The inclusion of a variable closed current loop is planned for Tiros II in order that the angle between the sun and the satellite spin axis should not exceed 35°. Tiros I's orbital position at injection, and its theoretical and observed motion are shown by illustrations. *Subject Headings:* **1. Satellite orbits 2. U. S. satellite 1960, Beta (Tiros I) 3. Satellite spin.** —*O.T.* Ⓢ

12.6–97 551.507.362.2

†Cook, G. E.; King-Hele, D. G. and Walker, Doreen M. C. (*all, Royal Aircraft Establishment, Farnborough*), **The contraction of satellite orbits under the influence of air drag. I. With spherically symmetrical atmosphere.** *Royal Society of London, Proceedings, Ser. A.* 257(1289): 224–249, Sept. 6, **1960.** 9 figs., 27 refs., eqs. **DWB, DLC (Q41.L7)**—The effect of air drag on satellite orbits of small eccentricity $e(<0.2)$ is studied analytically by a perturbation method, on the assumption that the atmosphere is spherically symmetrical. Equations are derived which show: (1) How perigee distance and orbital period vary with eccentricity as the orbit contracts, and (2) How each of these quantities varies with time. The equations of type (1) are nearly independent of the oblateness of the atmosphere. In all the equations, terms of order e^4 and higher are usually neglected. The results are also presented graphically in a manner designed for practical use. *Subject Heading:* **1. Satellite orbits.** —*Authors' abstract.* Ⓢ

12.6–98 551.507.362.2:531.56:551.510.53

Liakh, R. A., **K voprosu o vliianii soprotivleniia atmosfery na dvizhenie iskusstvennogo sputnika.** [Influence of atmospheric resistance upon the motion of the artificial satellite.] *Akademiia Nauk SSSR. Institut Teoreticheskoĭ Astronomii, Biulleten'*, 7(5):321–326, **1959.** 4 refs., mostly eqs. English summary p. 321. **DLC**—The aim of this article is to investigate the influence of atmospheric resistance upon the semi-major axis a and the excentricity e of the earth satellite's orbit. In the article by Y. C. Chang and Chia-Hsiang Chang (1957) such an investigation has been made and secular perturbations in a and e have been received up to terms of the first order in e. We use the method proposed by these authors for determining both secular and periodic perturbations in a and e up to terms of the third order in e. *Subject Headings:* **1. Satellite orbits 2. Aerodynamic forces on satellites.**—*Author's abstract.* Ⓢ

12.6–99 551.507.362.2

Bilancini, Raoul, **Meteorologia e satelliti artificiali.** [Meteorology and artificial satellites.] *Le Vie d'Italia*, Milan, 66(7):890–897, July **1960.** 9 photos, map. **DWB** (P)—This is a

discussion of the use of satellites for meteorological purposes with special reference to Tiros Photographs of Tiros I, its launching, and three photographs taken by Tiros I are include Some of the orbital paths taken by Tiros I are mapped. One of the results of the data provide by Tiros I was that it appears now that the upper atmosphere is denser than previously believe *Subject Headings:* **1. Meteorological satellites 2. U. S. Satellite, 1960 Beta (Tiros I).**—*E.Z.S.*

12.6–100 551.507.362.

Ritter, Milton (*RCA Astro-Electronic Products Div., Princeton, N. J.*), **Thermal desig for Tiros.** *Astronautics*, N. Y., 5(6):40–41, 92–96, June **1960.** 6 figs., 3 eqs. **DLC**—Th paper explains how the heat balance problem for Tiros I was solved. The analyses, materia development and laboratory testing are described. Payload temperatures are shown wit reference to orbital parameters. The scheme of direct measurement of α/ϵ apparatus illustrated. Curves are drawn to represent: the flux on surfaces due to Earth's albedo/satellit altitude-325 nautical miles, flux on surfaces from thermal emittance of Earth/satellite altitude Curves show the reflectance of cells coated with SiO/MgF_2 film combinations and the effe of coating upon the effective emissivity of solar cells, *Subject Headings:* **1. Satellite tempera tures 2. U. S. Satellite, 1960 Beta (Tiros I).**—*E.Z.S.* Ⓢ

12.6–101 551.507.362.2:551.326.7:778.3(261

Wark, D. Q. and Popham, R. W. (*both, U. S. W. B., Wash., D. C.*), **Tiros I observation of ice in the Gulf of St. Lawrence.** *Monthly Weather Review*, Wash., D. C., 88(5):182–186 May **1960.** 5 figs., **DWB, DLC**—Tiros I pictures of the Gulf of St. Lawrence, taken durin the first days after launching, have clearly revealed areas of ice. The ice patterns found in tw series of pictures are mapped. Also shown are aircraft observations of ice made a week earlie and a week later. The results indicate that observations from satellites might contribute t ice surveys. *Subject Headings:* **1. U. S. Satellite, 1960 Beta (Tiros I) 2. Ice survey 3. Photographic observation techniques 4. Gulf of St. Lawrence, North Atlantic.**—*Author' abstract.*

12.6–102 551.507.362.2:551.576.1:77

Tiros I concludes mission, Tiros II readied. *Weatherwise*, Boston, 13(4):159–161;180 Aug. **1960.** fig., 12 photos. **DWB**—The first Weather-eye Satellite, Tiros I, ended its life after transmitting 23,000 photographs. The cameras of Tiros I scanned cloud formations from 50°N to 50°S at an average height of 450 mi above the earth. The success of Tiros I has put the meteorological satellite program well ahead of schedule. *Subject Headings:* **1. Satellite photography 2. Cloud photographs 3. U. S. Satellite, 1960 Beta (Tiros I).**—*A.H.K.*

12.6–103 551.507.362.2:551.557

Faulkner, C. R., **Effect of upper atmosphere wind on the rotation of satellite 1958 δ1.** *Nature*, London, 187(4741):926–927, Sept. 10, **1960.** 4 refs. **DWB, DLC**—Changes in the rotation of 1958 δ1 (Sputnik 3 rocket) can apparently be explained by the existence of a strong westerly wind in the upper atmosphere. The rotation period increased at a decreasing rate until mid-Nov. 1958 and then decreased during the last few days of flight. There was a significant change in late July 1958 coinciding with the entry of the perigee into denser tropical atmosphere. The observed end-over-tumbling of the rocket about an axis perpendicular to the rocket axis would be most sensitive to accelerating windmill behavior generated by the wind. All the features of the orbit are accounted for by wind-action more convincingly than by any other theory. *Subject Headings:* **1. Satellite orbits 2. High level winds 3. Wind effects on satellites 4. Soviet satellite, 1958 Delta (Sputnik III).**—*R.B.*

12.6–104 551.507.362.2:621.396.8

Roger, R. S. and Thomson, J. H. (*both, Jodrell Bank Experimental Station, Univ. of Manchester, Lower Withington*), **Faraday effect in the transmissions from fast spinning satellites.** *Nature*, London, 186(4725):622–623, May 21, **1960.** 2 figs., 2 refs. **DWB**—The effect of interaction of satellite spin and Faraday rotation is analyzed in the case of a satellite with a rotation period small compared to the Faraday fading period. The variations effecting

maximum and minimum signal strength are illustrated by the various positions of a satellite rotating about an axis fixed in space with a transmitting dipole which is not coincident with the rotation axis. Records of the 108 Mc/s signals of 1958 β2 (Vanguard I) show a Faraday fading period normally greater than 30 sec at a rotation period about 6 sec. The points on the record corresponding with the positions of a dipole with its rotation axis and axis of symmetry not coincident can be determined to within ±3 sec. *Subject Headings:* **1. Satellite spin 2. Faraday effect 3. U. S. Satellite, 1958 Beta (Vanguard I).**—*O.T.* Ⓢ

12.6–105 551.507.362.2:551.521.64

Vernov, S. N.; Vakulov, P. V. et al., **Izuchenie miagkoĭ komponenty kosmicheskikh lucheĭ za predelami atmosfery.** [Study of the soft component of cosmic rays beyond the atmosphere.] *Iskusstvennye Sputniki Zemli*, Moscow, No. 2:61–69, **1958.** 6 figs. **DLC.** Transl. into English in *Artificial Earth Satellites*, N. Y., Plenum Press, **1960.** Vol. 2: 78–89. **DWB** —Data on photons at high altitudes were obtained on the third artificial satellite by means of a luminescent counter which consisted of a cylindrical crystal of NaI, 40×39 mm, and by a photomultiplier with photocathode having a diameter of 40 mm. Measurements were made of the rate of count of events when the impulse corresponds to an energy production greater than 35 kev in the crystal, of the magnitude of the anode current of the photomultiplier, and of the magnitude of the current of the intermediate dinode. The method of measurement of these quantities and the transmitter of the radio signals are described. The results of measurement of the intensity of the count indicated that the number of impulses exceeded in all cases by more than ten fold the expected rate of count from primary cosmic rays; so that the principal element in the count intensity is the recording of photons. The ionization measurements exceed several times the ionization produced by cosmic rays. The fact that a large part of the ionization is not associated with cosmic rays follows from the fact the difference between the anode and dinode currents is slight. The "excess ionization" is explained only by the long wave illumination phosphorescence of the NaI crystal. Over the U.S.S.R. the excess ionization is explained by the "memory" of the crystal illuminated over the equator. The sharp increase in counting rate at a given moment, observed when the satellite is at latitude 60°N, is not accompanied by increased ionization so that the energy of the particle is small and photons are being recorded. The marked dependence of intensity on geographic coordinates is observed only in the case of charged particles. These facts are explained on the assumption that the counter records decelerated electrons completely absorbed in the envelope of the satellite. A zone of high intensity of particles was observed at a height of 1200 km and on movement of the satellite toward the equator the intensity increased even though the height of flight fell from 1600 to 1100 km. The principal role in this effect is the factor of accumulation. Numerous measurements were made over the U.S.S.R. (since measurements of luminescence correspond to experimental characteristics) to obtain equatorial data. The full amount of energy produced in the crystal during one revolution of the satellite was obtained, namely 3.10^{11} ev/sec. The stability of this magnitude was quite high—the scatter was 30%. But its intensity diminished systematically by day when satellite altered its position relative to the geographic coordinates. Finally, in order to detect gamma radiation of the sun the variation of photon intensity during a solar flare was investigated. The photon stream of the sun did not exceed a certain definite magnitude and the limits depended upon the emitted energy of the photons. *Subject Headings:* **1. Soft cosmic rays 2. Satellite cosmic ray data. I. Gorchakov, E. V. II. Logachev, Iu. I. III. Chudakov, A. E.**—*I.L.D.*

12.6–106 551.507.362.2:551.594.12:621.396.8

Kraus, J. D.; Higgy, R. C. and Crone, W. R., **The satellite ionization phenomenon.** *Institute of Radio Engineers, N. Y. Proceedings*, 48(4):672–678, April **1960.** 5 figs., table, 7 refs. **DLC** —A number of observations are presented which show a close correlation between CW-reflected HF signals and passes of artificial earth satellites. The periodic (nonrandom) occurrence of the signal bursts and the symmetry of some burst sequences are indicative of satellite-related phenomena. The occurrence of a variety of satellite-related Doppler effects are described and several satellite ionization mechanisms are also discussed. The possible relation of the satellite phenomenon to prior solar activity is mentioned. *Subject Heading:* **1. Ionization by satellites.**—*Authors' abstract.* Ⓢ

12.6–107 551.584.9:551.524:551.507.362

Simas, V. R.; Martin, J. B. and Humphrey, E. C. (*all, Goddard Space Flight Cente Wash., D. C.*), **Determination of the internal temperature in satellite 1959 Alpha (Vanguard II** *U. S. National Aeronautics and Space Administration, Technical Note* D–357, June 196 18 p. 12 figs., 7 refs. **DWB, DLC**—Satellite 1959 Alpha was equipped so that accurat measurement of the minitrack beacon frequency (with the Doppler component removed) wa sufficient to determine the satellite's internal temperature. To provide a precise measuremer of this frequency a sensitive receiving system, utilizing a highly stable but tunable first loca oscillator and a noise-eliminating tracking filter, was developed. In addition to the tempera ture determination, considerable other information such as roll rate and rocket performanc was obtained from the observations. *Subject Headings:* **1. Satellite temperatures 2. U. S satellite, Alpha 1959 (Vanguard II).**—*Authors' abstract.* Ⓢ

B3. AGRICULTURE

See also: **Met. instruments and measurements** (Stružka), 12.6–18; **Antiozonants to protect plants** (Rich, Taylor), 12.6–302; **Probable occurrence of freezing temps. in Wenatchee-Okanogan fruit producing area** (Phillips), 12.6–351.

12.6–108 551.584.2:551.457(474.5

Dorfman, Ts. Ia., **K voprosu o mikroklimate sel'skokhoziaĭstvennykh poleĭ na osushennykl bolotakh territorii Litovskoĭ SSR.** [The microclimate of agricultural areas in drained swamp in the Lithuania.] *Lietuvos TSR Mokslų Akademija. Geologijos ir Geografijos Instituta Moksliniai Pranešimai*, Vol. 9:175–186, **1959.** 5 figs., table, 5 refs. Lithuanian and Germar summaries p. 185–186.—The microclimate was studied by field observations carried out from May 29 to June 26, 1956 by a group of climatologists of the Vilnyus Hydrometeorological Observatory headed by the author. This report discusses the methods of observation and describes the weather characteristics during the period of observations. The second part o the paper deals with the heat and air humidity regime at 20–150 cm above the grass covered earth surface. In the third part, the author gives the characteristics of daily variation of soi temperature at 5–20 cm depth, in cultivated and fallow fields. *Subject Headings:* **1. Drained swamp microclimatology 2. Lithuanian S.S.R.**—*A.M.P.*

12.6–109 551.584.42:633.18

Wagner, R. (*Klimat. Instit., Universität Szeged*), **Angaben zum Mikroklima der Reisfelder in Kopancs.** [Data on the microclimate of rice fields in Kopancs.] *Acta Climatologica*, Szeged, Hungary, 1(1/4):3–27, **1959.** 12 figs., 2 tables. **DWB?**—It was possible to determine, on the basis of the author's research of 1956 and 1957, that microclimatic events may have a significant effect on rice disease. The conditions for rice disease are occasioned by specific microclimatic situation changes. Sudden change in the microclimate is, of course closely connected with weather conditions. The change in the microclimate produces various chemical, physical and biological processes in the soil as well as in the water and the plant is affected by these. The results of our research up to now can be summarized as follows: 1) the microclimatic conditions of rice crops under various weather situations were investigated, and reported; 2) it was determined that microclimatic changes (a sudden lasting cooling) play an important role in the development of certain rice diseases and 3) the cooling of the irrigating water of the rice seems to be a convenient method to determine the resistance. *Subject Headings:* **1. Rice field microclimatology 2. Kopancs, Hungary.**—*Transl. of author's abstract (O.T.).*

12.6–110 551.584.43:634.8:631.544:678.5

Primault, Bernard (*l'Institut Suisse de Météorologie, Zurich*), **Des répercussions d'enveloppes de plastique sur le microclimat de la vigne.** [The effect of plastic screens on the microclimate of vines.] *Geofisica e Meteorologia*, Genoa, 8(1/2):16–22, Jan./April **1960.** 4 figs., 3 tables, 3 refs. French and English summaries p. 21–22. **DWB**—Earlier experiments have proved that plastic-screens placed over the vine-stocks during the time of grape maturation improve the quality of the vine. The author investigated the surrounding microclimate. He could not measure the humidity because of technical difficulties. But he measured exactly and in detail the temp. under the screens. He used screens of three different colors (transparent,

red, green) but found no significant differences between them. At night, the temps. are 1°C lower under the screen than in the open air. On the other hand he found an increase of the mean temp. of 4° at certain hours in the day-time. For the whole period of trials (40 days) the rise of the 24 hour mean temp. is only 0.64°C. *Subject Headings:* **1. Vine microclimatology 2. Plastic screen effects on vines.**—*Author's abstract.*

B4. FORESTRY

See also: **Mudflows and forestry measures for controlling them** (Mamedov), 12.6-33; **Forest and range influences publications,** 12.6–84.

12.6–111 551.584.41

*Heckert, Lothar, **Die klimatischen Verhältnisse in Laubwäldern.** Climatic conditions in deciduous forests.] *Zeitschrift für Meteorologie*, Berlin, 13(9/10):211–223, Sept./Oct. **1959.** 8 figs., 5 tables, 2 refs. German and English summaries p. 211. **DWB, DLC**—After a brief survey of the climatic conditions in a hardwood stand, as derived from earlier papers, the observation site, the measuring equipment and the results of a two years recording, at eight levels, of temp., humidity, wind speed and global radiation in the Potsdam municipal oak forest are described. Though the existence of an active surface in the crown region cannot be doubted, this study leads to a conclusion as to the relevant thermodynamic processes which is entirely different from conventional ideas. Conversion of energy does not cause the development of an atmospheric partition surface; on the contrary, there forms a layer of thermal turbulence providing the exchange of air between the inside and outside air, thus establishing a surprisingly active vertical ventilation of the forest. *Subject Headings:* **1. Forest microclimatology 2. Deciduous forests 3. Potsdam, Germany.**—*Author's summary.*

12.6–112 551.585.55(584.6)

Doskach, A. G. and Fel'dman, IA. I., **Nekotorye osobennosti fizikogeograficheskikh uslovii tselinnykh i zalezhnykh zemel' na territorii Kustanaĭskikh stepeĭ.** [Some features of physiographical conditions in the virgin and waste lands of the Kustanai Steppes.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geograf.*, No. 4:60–68, July/Aug. **1957.** 11 refs., 7 figs. **DWB**—The distribution of aspen-birch shrubs is a characteristic of the western Siberian steppe. To the west and east, forest vegetation extends far to the south while it is almost entirely absent in the central part of the territory. The relationships of these features to the local climate, resulting from the interaction of circulation processes with orographic conditions, is discussed. The physical geography of the Kustanai Steppes including orography, relief, drainage and the forest steppe and steppe zones are described in detail with the aid of a map showing the natural zones and orographic regions of the eastern Transurals and physical geographic profiles through the southeastern Transurals southward from Troitsk, northward from Kustanai and southward from Semnozernoe. As a result of the weakening of the west-east transport of air masses and intensification of meridional circulation, the frequent alteration of the physically different northern and southern air currents is observed. During the summer the meridional circulation causes droughts. In the process of local transformation and radiational heating, cold air incursions acquire drought and sukhovei properties. In winter very low air temperature occur as a result of incursions of Arctic air and subsequent radiational cooling. Orography produces high precipitation on the western slopes of the Urals and low precipitation on the eastern slopes. In the Kustanai Steppes the air masses from the southwest and south deposit some precipitation on the Transural plateau and produce very little precipitation in the center of the steppe. Beyond the Turgai depression the air masses experience orographic elevation and on its western slope the remainder of the precipitation is deposited. Maps showing the mean January temperature and the mean annual rainfall amount and a graph showing the seasonal precipitation are presented. *Subject Headings:* **1. Steppe climates 2. Orographic effects on precipitation 3. Kustanai Steppes, Kazakh S.S.R.**—*I.L.D.*

12.6–113 551.586:581.8

Daubenmire, R. (*Botany Dept., State Col. of Wash., Pullman*), **Xylem layers of trees as related to weather and altitude in the Northern Rocky Mountains.** *Ecology*, Durham, N. C., 36(3):456–463, July **1955.** 2 figs., 3 tables, 17 refs. **DWB, DLC**—The wood layers in each of

four types of trees (*Pinus ponderosa, Psedotsuga taxifolia, Abies grandis* and *Thuja plicata*) were studied "in individuals situated at the lowest and highest ecologic limits along the western edge of the northern Rocky Mountains near Moscow, Idaho." The relationship between weather and xylem increment was studied statistically by calculating correlation coefficients and "by recording a plus for each year when both tree growth and temperature (or precipitation) increase in comparison with the previous year," and a minus when the trends are not in the same direction. A similar study was carried out at Spokane, Wash. It was found that a relationship existed between xylem formation and climate over a fifty-year period. *Subject Headings:* **1. Xylem layers of trees 2. Climatic effects on tree growth 3. Northern Rocky Mountains.**—*I.L.D.*

B5 MEDICINE AND HEALTH

See also: **Physics and med. of atmos. and space,** 12.6 7; **Atmos. pollution by aeroallergens** (Sheldon, Hewson), 12.6–290; **Classification of climat. health resorts, Switzerland** (Mörikofer), 12.6–433; **Sanitariums of the Odessa region** (Belen'kiĭ et al.), 12.6–434; **Influences of biol. seasons on health resort patients** (Wagner), 12.6–435; **Analysis of conventional climatic data in resort climat.** (Wojtowicz), 12.6–436.

12.6–114 551.586:612.014.4

†Dubos, René J. (*Rockefeller Inst.*), **Problems in bioclimatology.** *National Academy of Sciences, Wash., D. C., Proceedings,* 45(12):1687–1696, Dec. **1959.** 38 refs. **DLC**—This paper illustrates the effects of climatological factors on different types of biological phenomena; on the regular endogenous rhythms which exhibit diurnal or seasonal periodicities; on the long range fluctuations in size and behavior of populations; on the immediate physiological disturbances which are caused by the vagaries of the weather. It is emphasized that the biological responses to the environment cannot be described merely in terms of immediate direct effects, but must be regarded as dynamic processes, conditioned by the adaptive powers of the organisms, and often resulting in long range cumulative alterations. *Subject Headings:* **1. Bioclimatology 2. Physiological meteorology.**—*I.S.*

12.6–115 551.586:612.014.4:613.95(43–11)

Noack, H. and Otto, W. (*Germany*), **Statistische Untersuchungen zur Frage jahreszeitlicher Schwankungen der Körpermasse bei 100,000 neugeborenen Berliner und Leipziger Kindern.** [Statistical investigations on seasonal variations in body measurements of 100,000 newborn children in Berlin and Leipzig.] *International Journal of Bioclimatology and Biometeorology,* Leiden, Vol. 1, Pt. 4, **1957.** 1 p. **DWB**—An examination of infants for 1934–1953 made in Berlin and Leipzig showed significant seasonal differences in body length; a binodal curve, with maxima in March–April and Oct., and minimum in May–June, was obtained. Infants born in the second half of the year appeared to be heavier. The following elements show seasonal variation: birth rate; frequency of premature births; length of new born infants; pregnancy time; short duration of birth; edema; hypertension; fever at birth; breathing complications; embolism, etc. Over a period of 50 years the seasonal variations of still births has remained the same: maximum during winter and minimum during summer months. *Subject Headings:* **1. Human bioclimatology 2. Infants.**—*I.L.D.*

12.6–116 551.586:616:001.4

†Sargent, Frederick, II (*Univ. Illinois*), **Changes in ideas on the climatic origin of disease.** *American Meteorological Society, Bulletin,* 41(5):238–244, May **1960.** 3 figs., 30 refs. **DWB**—There is a school of thought which holds the concept that the atmospheric environment probably conditions the onset and may even cause the development of disease. This school has a record as ancient as that of medicine itself. In this communication, this school of thought is surveyed, tracing, particularly, the changes which have taken place in the original idea that disease has a climatic origin. From such a viewpoint, one can understand the current concepts regarding "meteorotropism" and "climatic disease," and with this background we can make sound judgments about the claims of the school regarding pathophysiological processes. In 1855, Haviland proposed that the system of medical thought which maintained that disease was caused by the atmospheric environment be called iatrometeorology. This term was most

appropriate, for it employed the prefix "iatro" in the same sense that it had been used in the seventeenth and eighteenth centuries by members of the iatromathematical or iatrophysical schools who explained the phenomena of the body predominantly on the basis of physics or mathematics and by exponents of the iatrochemical school who insisted upon a chemical basis. There is good evidence that, within recent decades, such general concepts regarding body processes have been revived. In so far as iatrometeorology is concerned, it is suggested the term be used to identify the modern school of meteoropathology. *Subject Headings:* **1. Meteoropathology 2. Iatrometeorology.**—*Author's abstract.*

12.6–117 551.586:612.014.4

Undt, W. (*Vienna*), **Indirekte Wetterwirkungen auf den Menschen.** [Indirect weather effects on man.] *Annalen der Meteorologie, Medizin-Meteorologische Hefte*, No. 13:49–55, **1958.** 8 figs., refs. **DWB**—The author discusses various biological phenomena which are directly influenced by weather and which affect human beings so that weather influences upon man are mediated by these biological phenomena. The discussion includes an account of the relationship between the micro-organism count of water and precipitation and snow melt weather, the relationship between atmospheric micro-organism count and precipitation and atmospheric temperature (microorganisms decreased with rainfall and low air temperature but barometric pressure and sunshine duration showed no effect), the effect of *pH* of the air upon atmospheric molds, the diurnal variation of the micro-organism content of the atmosphere and the role of turbulence; and the effect of weather elements upon incidence of insects. *Subject Headings:* **1. Weather effects on man 2. Physiology.**—*I.L.D.*

12.6–118 551.501.5:551.586:612.014.43(94)

Gaffney, D. (*Bureau of Met., Perth*), **Climatic discomfort in the Kimberleys.** *Australian Meteorological Magazine*, Melbourne, No. 27:19–27, Dec. **1959.** 2 figs., table, 15 refs. **DWB**—Mean monthly dry and wet bulb temperatures for several localities in the Kimberleys are tabulated. A climatic discomfort diagram is then constructed based on a plot of mean dry bulb against mean wet bulb. These temperature values for the Kimberley stations are then plotted graphically on the diagram to show relative degrees of discomfort throughout the year. Mean monthly dry and wet bulb temperatures together with appropriate mean monthly wind speeds are applied to the effective temperature nomogram in order to derive mean monthly effective temperatures for the Kimberley stations. The effective temperatures are plotted to indicate graphically the actual and relative changes in climatic discomfort during the year. Since effective temperatures makes allowance for the effect of mean wind speed, it is considered to be more satisfactory than previous measurements of discomfort based solely on air temperature and humidity. *Subject Headings:* **1. Climatic discomfort diagrams 2. Kimberleys, Australia.**—*Author's abstract.*

12.6–119 551.586:613.79

Svorad, D. and Wellnĕrová, J., **Vliv nĕkterých meteorologických faktorů na rytmus spánku a bdění se zvláštním zretelem k nespavosti.** [The influence of some meteorological factors on the sleeping and wakeful rhythm with special reference to insomnia.] *Československá Akademie Věd, II Celostátní Bioklimatologická Konference, Nov. 3–5, 1958*, issued Prague, **1960.** p. 110–112. 10 refs. English summary p. 112.—The sleeping and wakeful rhythm and the effect of lack of sleep and insomnia on the sleep depth were investigated in rats at various temperatures (21 and 27°C) and relative air humidity (50 and 90%). The normal sleeping and wakeful rhythm is impaired at 27°C and air humidity 90%. A similar result was obtained after short-lasting exposition to cold and moist air (+1°C, 90%). Following restriction of sleep to four hours, the sleep depth increases with higher temperature, and especially the greater the air humidity of the animals' environment. Air humidity is of decisive significance for the sleep depth after insomnia. The greater air humidity is followed by a longer sleep depth. *Subject Headings:* **1. Meteorological effects on insomnia 2. Insomnia.**—*Authors' abstract.*

12.6–120 551.584.61:551.524

Gäbelein, K.; Liese, W. et al., **Zimmertemperatur im Sommer und Winter.** [Room temperature in summer and winter.] *Umschau*, Frankfurt a.M., 58(23):740, Dec. **1958.**

DWB, DLC—Explanations of the fact that room temperature of 18°C is adequate in summer but not in winter are presented. In the winter cold walls or a cold window and the presence of a heating unit produce a continuous air movement, which conducts body heat more intensively. In winter the body also loses more calories so that frequently hour-long exposures to high temperature are necessary. Furthermore, during summer room and outdoor temperatures are practically equal. In winter the air temperature of a room may be 19°C and the mean surface temperature of walls, ceiling and floor may be 18°C, so that the sensible temperature is 17°C. In order to obtain a temperature is 17°C. In order to obtain a temperature of 18°C the air temperature should be 21.5°C; with air movement this temperature must be raised. Humidity control produces no improvement. Adaptation also is important as is illustrated by air temperatures of room heated with ovens and with steam heat. *Subject Headings:* **1. Room temperatures 2. Indoor air exchange. I. Hille, H. II. Rudolph, H.-H.**—*I.L.D.*

12.6–121 551.521.17:615.838

Kaĭkov, I. M., **Ul'trafioletovaia radiatsiia v Murmanske i ee gigienicheskaia kharakteristika.** [Ultraviolet radiation in Murmansk and its hygienic characteristics]. *Gigiena i Sanitariia*, Moscow, 24(3):76–78, March **1959.** 2 tables, 4 refs. **DLC**—An analysis of results of continuous ultraviolet radiation observations during 1953–1955 at Murmansk by the photochemical oxalic acid method showed that the distribution of ultraviolet radiation is very uneven throughout the year and that 60% of it occurs during May–July, and almost nothing during the polar winter. A conversion of the quantity of decomposed oxalic acid into erythema doses shows that during summer the ultraviolet radiation amounted to 123–213 erythema doses, which is more than adequate. Nevertheless, in view of the severe climate (no more than 15–20 clear days per year), the population wears thick lightproof clothes whose permeability for ultraviolet radiation is almost zero. Consequently the population experiences a shortage of ultraviolet radiation throughout the year which should be remedied, especially for children, by exposure to artificial ultraviolet radiation. *Subject Headings:* **1. Ultraviolet radiation distribution 2. Erythema dose 3. Murmansk, U.S.S.R.**—*A.M.P.*

12.6–122 551.586:616:519.24

Undt, W. (*Vienna*), **Hinweise auf einen Beitrag der Kommunalstatistik zur Grundlagen forschung der Medizin-Meteorologie.** [Remarks on a contribution of municipal statistics to basic research in medical meteorology.] *Wetter und Leben*, Vienna, 10(11/12):175–177, **1958. DLC**—In the case of municipal statistics, medical meteorology has the task of establishing the existence of possible relationships between the atmospheric environment and the organism, based upon the methods of mathematical probability. In addition to the frequency distribution of disease within particular regions, the influence of orography and particular weather stimuli, there exists also the special problem of atmospheric stimuli upon physiological processes. Further problems are those of air pollution, radiative substances, etc. In order that the particular combinations of weather stimuli can be designated, shorter time intervals than the usual weekly or monthly ones generally employed must be introduced. In addition to an examination of morbidity statistics, a number of diseases must be considered which ordinarily are inadequately treated. Such premorbid conditions are illustrated by purely functional disturbances preceding cardiac and vascular diseases. The regional classification of medical data is important as is indicated by the fact that within a city there may exist different degrees of air pollution depending upon location of industry, wind direction, etc. *Subject Headings:* **1. Medical meteorology research 2. Public health.**—*I.L.D.*

B6. MARINE METEOROLOGY

12.6–123 551.501.9:551.507.2(265)

Il'inskiĭ, O. K., **Proekt razmeshcheniia korablei pogody na Dal'nem Vostoke.** [Proposal for locating weather ships in the Far East.] *Akademiia Nauk SSSR. Okeanograficheskaia Komissiia, Trudy*, 3:20–23, **1958.** fig. **DLC** (GC1.A47A2)—Recognizing the urgent need for better forecasts for commercial and fishing vessels (and for aviation) in the waters of the Far East the author presents a logical proposal for five weather ships (shown on a chart)

to be located: 1) in the Japan Sea at 39°N, 134°E; in the Okhotsk Sea at 52°N, 150°E; the North Pacific at 40°N, 153°E and 46°N, 163°E; and in the Bering Sea at 57°N, 175°E. The reasons for selecting these points are set forth, giving arguments based on known synoptic and aerological peculiarities of each area. Lack of consistent ship reports, or of enough upper air data is given as the initial reason for this need. Analysis of climate and weather forming processes also requires more detailed data. It is stated that five foreign weather ships operate in the Pacific and the U.S.S.R. should participate in such an endeavor by filling in this huge gap in network. *Subject Headings:* **1. Weather ship network proposal 2. Soviet Weather Ships 3. Northwest Pacific.**—*M.R.*

12.6–124 551.506:681.177

Schilling, Fritz, **Die Wetterbeobachtungen von See und das Lochkarten-Verfahren.** [Weather observations at sea and the punched card method.] *Der Seewart*, Hamburg, 21(1):14–20, Feb. **1960.** 4 figs. **DWB, DLC**—In Germany, the task of converting the backlog of ship weather observations into a climatological file directly useful to mariners has been assumed by the Deutsche Seewarte and its post-war successor, the Seewetteramt, at Hamburg. The punching of ship observations began in 1942; there are now 14 million punched cards on file. These were prepared from ships' logs dating back to the year 1900. Thousands of older logs are still to be processed. The cards have been sorted by 10 degree squares (Marsden system), and then by 5- and 1-degree squares. Sample ship observations and the corresponding punched cards are illustrated. While the total file of punched cards is imposing, the observations are distributed heavily along shipping lanes, leaving other areas inadequately covered. Thus much work remains to be done. *Subject Headings:* **1. Ship's log data 2. Punched card data collections 3. Marine climatic data.**—*R. S. Quiroz.*

12.6–125 551.506:551.507.2(261.2,261.3)

*Hamburg. Seewetteramt, **Meteorologische Beobachtungen von deutschen Feuerschiffen der Nord-und Ostsee (Bundesrepublik) 1956.** [Meteorological observations by German lightships (Federal Republic) in the North and Baltic Seas, 1956.] Its *Einzelveröffentlichungen*, No. 22, **1959.** 95 p. mostly tables. **DWB**—This report consists entirely of tabulated data collected in 1956 by several German ships in the North and Baltic Seas. The tables contain air and water temperatures, relative humidity, visibility, air pressure, wind direction, strength and velocity, wave direction, period and height, clouds and cloud cover, and precipitation amounts. *Subject Headings:* **1. Meteorological data, North Sea 2. Meteorological data, Baltic Sea 3. North Sea 4. Baltic Sea.**—*E.Z.S.*

12.6–126 551.5:910.45

§Lawrence, Henry U. (*U. S. W. B. Airport Stat., Boston, Mass.*), **Weather notes on a familiarization voyage.** *Mariners Weather Log*, Wash., D. C., 3(5):175–180, Sept. **1959.** 9 figs. **DWB**—The author, a professional meteorologist, describes the 2,317 mi crossing from Bergen, Norway to Argentia, Newfoundland aboard M/S "Mormacsaga." The trip required 11 days, 6 hours instead of the normal 6 days, due to encountering of four gales of hurricane force and 70–80 foot waves. Daily weather maps and data are given. *Subject Headings:* **1. Marine meteorological data 2. North Atlantic Ocean.**—*W.N.*

B7. RADIOACTIVITY

See also: **Fallout from nuclear weapons tests,** 12.6–5; **Application of weather radar to fallout prediction** (Austin), 12.3–37; **Measurements of radioactivity, Ireland,** 12.6–263.

12.6–127 551.510.721:519.241.6

†Martell, E. A., **Global fallout and its variability.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 65, Oct. **1959.** 26 p. 9 figs., 3 tables, 20 refs. **DLC, DWB**—Ba^{140}/Sr^{90} activity ratio data for individual rains are discussed to show means of distinguishing between stratospheric or tropospheric origin of fallout. Sr^{89}/Sr^{90}/ activity ratio data allow approximate estimation of the fallout contribution from major test series. Evidence for variation in stratospheric storage times, transport paths, and fallout distribution areas is

discussed. Estimated residence times are 6 months to 1 year for Soviet tests, 1 to 2 years for debris in the lower equatorial stratosphere, and 5 to 10 years for the CASTLE tests. *Subject Headings:* **1. Global fallout patterns 2. Strontium^{90} fallout.**—*Author's abstract.*

12.6–128 621.039:539.16:551.462

Luedecke, A. R., **AEC gives views on radioactive waste disposal at sea.** *Science*, Wash., D. C., 130(3374):492, Aug. 29, **1959. DLC**—Excerpts from testimony by A. R. Luedecke, director of the AEC, on the NAS, given on 29 July before the Special Subcommittee on Radiation. The full report is published as the National Research Council report titled **Radioactive waste disposal into Atlantic and Gulf coastal waters.** The report examines the feasibility of disposing of the low-level wastes closer to shore than the 1000 fathom disposal sites used by AEC. The inshore areas are considered as safe for disposing of solid or packaged low-level wastes up to 250 curies per year of the most biologically significant isotope without causing any adverse effect on man. *Subject Headings:* **1. Radioactive waste disposal 2. Radioactive sea water.**—*I.S.*

12.6–129 551.510.72:551.542(52)

Murayama, N., **On the relationship between the variations of airborne radioactive concentrations and the sea level pressure patterns in Japan.** *Journal of Meteorological Research*, Tokyo, 11(7):588–599, July **1959.** 8 figs., 4 tables, 5 refs. In Japanese; English summary p. 588. **DWB, DLC**—In this paper the author statistically investigated the relationship between the variation of air-borne artificial radioactivities and the pressure patterns at sea level in Japan during the period of IGY/IGC. The results are as follows: (1) Increases of radioactive concentration in the atmosphere at sea level appear in the high pressure regions, especially in the forward parts of anticyclone. The radioactive concentrations considerably decrease in the centers of cyclone. To account for this it is presumed that the radioactive dusts which will be carried down to the lowest altitude by subsidence in the anticyclone will fall on the earth's surface under the divergence flow from the anticyclone toward the lower pressure parts. (2) Variation of air-borne radioactive concentration in the atmosphere at sea level during the passage of typhoon near or over the Japan Islands is found. On such occasions the behavior of the radioactive dusts is much the same as mentioned above. (3) The air-borne radioactive concentrations increase when the weather is clear or cloudy, while they decrease when rain falls. These observations can be explained in much the same way as mentioned in (1), if it is assumed that the clear and cloudy weathers appear in the region of anticyclone and the precipitation is produced only in the region of cyclone. (4) Between two altitudes in the lower troposphere the air-borne radioactive concentration of the higher altitude is larger than that of the lower when the weather is clear and cloudy, while these values are equal or the relation between them is inverse when precipitation is produced. *Subject Headings:* **1. Artificial radioactivity 2. Radioactivity in the atmosphere 3. Pressure-radioactivity relationships.**—*Author's abstract.*

12.6–130 551.510.72:662.2:539.1

Lockhart, Luther B., Jr.; Baus, R. A.; Patterson, R. L. and Saunders, A. W., Jr. (*all, U. S. Naval Res. Lab., Wash., D. C.*), **Contamination of the air by radioactivity from the 1958 nuclear tests in the Pacific.** *Science*, Wash., D. C., 130(3368):161–162, July 17, **1959.** 2 figs. **DLC**—By the use of bomb-produced tungsten–185 tracer, debris from the 1958 nuclear tests (Hardtack) held at the U. S. Pacific Proving Ground have been identified as they appeared in the ground-level air along the 90th meridian. A large amount of radiactivity from these tests appeared in South America, particularly at the high-altitude collecting stations. *Subject Heading:* **1. Radioactive contamination of atmosphere.**—*Authors' abstract.*

12.6–131 551.510.721:662.2:539.1(791)

McDonald, James E. (*Univ. of Arizona, Tucson*), **An analysis of effects of nuclear attacks on Tucson and Phoenix.** *Arizona Academy of Science, Journal*, 1(2):41–52, Oct. **1959.** 3 figs., table, 9 refs. **DWB**—This paper presents an interesting analysis of possible effects of nuclear attacks on two Arizona cities. The principal source of bomb-effect data on which this analysis is based is the AEC report **The effects of nuclear weapons (1957).** It is shown that

there are a number of regional characteristics that make survival in Arizona a distinctly different problem from that of survival in other geographical areas under nuclear attack. The paper is nicely illustrated by maps showing nuclear effects and fallout data. *Subject Headings:* **1. Nuclear explosion effects 2. Radioactive fallout simulation 3. Arizona.**—*I.S.*

12.6–132 551.508.91:551.510.721

Spaa, J. H. (*Philips Research Lab., Eindhoven, Neth.*), **A rapid indicating instrument for the stepwise measurement of airdust radioactivity.** *Health Physics*, N. Y., 4(1):25–31, Oct. **1960.** 5 figs., 4 refs. **DLC**—This paper describes some operational experience acquired with an instrument for measuring stepwise the radioactive contamination of air-borne dust. To bring down the background due to the natural radioactive gases always present in air, the α- and β-activity of the dust deposit are measured during the accumulation period. As there is a fairly linear relation between the activities due to the natural radioactive gases, it is possible by means of a simple circuit to balance the α- and β-count-rates such that a zero reading is obtained if only β- or α-contamination, respectively, is present. With a circuit so adjusted it proves to be possible with an air flow of $4m^3$/hr and a sample time of 12 hr to demonstrate during the accumulation period current normal levels of atomic bomb fallout (10^{-12}–10^{-11} $\mu c/cm^3$). Some discussion is devoted to the promising possibilities of using this instrument in plutonium laboratories to detect the MPC within several hours. *Subject Headings:* **1. Radioactive contamination of atmosphere 2. Radioactive fallout computers.**—*Author's abstract.*

12.6–133 551.501:551.510.721

†Lindell, Bo (*Inst. of Radiophysics, Stockholm*), **An approach to the question of computing doses and effects from fall-out.** *Health Physics*, N. Y., 2(4):341–365, May **1960.** 15 figs., table, 24 refs., 74 eqs. **DLC**—Estimates of the possible number of injuries that might occur as a result of fall-out from nuclear weapons tests are frequently presented in scientific literature. In most cases the emphasis is put on the numerical result, which invites criticism, since the validity of certain assumptions, especially those regarding the biological effect of small doses cannot be proved. The great number of uncertainties involved in such estimations leads many authors to feel that rough approximations are justified. However, a number of important parameters are thus often overlooked, and certain assumptions necessary to the results are accepted without being recognized. This paper is an approach to the question of the parameters and assumptions that must be taken into account in such calculations; parameters and assumptions which would in fact influence the final considerations of the actual effects of radiation on a population. Provided that the physical fall-out mechanism is known, it is possible to calculate various organ doses that might be relevant to the biological effects. Calculations of the dose in the gonads and the bone marrow have been made, with special regard to the two extreme assumptions of biological dose effect relation, namely a linear relation without threshold, and a threshold relation. This survey of the parameters and assumptions leads to some interesting results; e.g., that there are indications that the *per capita* mean marrow dose in a population may be relatively little affected by the actual retention mechanism of Sr^{90} in bone. *Subject Headings:* **1. Radioactive fallout computations 2. Fallout effects 3. Radioactive fallout doses.**—*Author's abstract.*

12.6–134 551.501:551.510.721:539.165

Boyd, A. E. and Morris, E. E. (*both, Ottawa Univ., Ottawa, Kans.*), **Spatial distribution of energy dissipated by fallout β-rays.** *Health Physics*, N. Y., 2(4):321–325, May **1960.** 5 figs., 15 refs., 7 eqs. **DLC**—Calculations are described of the spatial distribution of energy dissipated in air by the delayed beta rays from products of slow neutron U^{235} fission. Results are given for both plane isotropic and point isotropic sources for times after fission of 1.12 and 23.8 hr. *Subject Headings:* **1. Radioactive fallout computations 2. Radioactive fallout distribution.**—*Authors' abstract.*

12.6–135 551.510.721:662.2:539.1

Dunning, G. M. (*Div. of Radiological Health, U. S. Public Health Serv., Wash., D. C.*), **Cobalt-60 bombs.** *Health Physics*, N. Y., 4(1):52–54, October **1960.** table, 4 refs., numerous eqs. **DLC**—Based on stated assumptions, the ratio of potential external energy releases from

fission products in "local" fallout compared to the cobalt-60 that may be produced can vary from a factor of 40, based on an exposure period from 1 hr to 1 month after a detonation, to 0.17 based on an exposure period from the twenty-fourth hour to 35 years. It is concluded that other factors, i.e. fission yields and position of firing, would be more critical in determining the external γ-hazard than the added cobalt-60. One megation (total yield) detonated in the air might create enough cobalt-60 to produce a theoretical total dose of 0.17 r in the most heavily contaminated band of the earth (30°–60° north latitude), with weathering and shielding effects reducing this by as much as a factor of 10. Decontamination measures could reduce this dose further. Other doses may be calculated as linear function of the tonnage assumed. Thus, the estimated doses could be significant in long-term effects but not lethal in the sense of wiping out a worldwide population. Mathematically, one can go to ever higher and higher assumed tonnage and cobalt-60 production until a lethal range is reached. *Subject Headings:* **1. Radioactive fallout hazards 2. Radioactive dosage 3. Cobalt-60.**—*Author's abstract.*

B8. RADIO COMMUNICATION

See also: **Radio weather aids,** 12.6-42; **Mathematics of wave propagation** (Budden), 12.6-180; **Reduction and processing F-layer propagation data** (LaTourrette), 12.6-181; **Irregularities and horizontal movements in the ionos.** (Ratcliffe), 12.6-182.

12.6–136 621.396.11:551.510.52:551.551

du Castel, F.; Misme, P. and Voge, J., **Propagation troposphérique. Commission II, XIIème Assemblée Générale de l'Union Radio Scientifique Internationale.** [Tropospheric propagation. Report of Commission II, XIIth General Assembly of the International Scientific Radio Union.] *L'Onde Electrique, Paris,* 38(376):503–513, July **1958.** 4 figs., 19 refs. **DLC**—Report made at the XIIth General Assembly of the I.S.R.U. held at Boulder. Among the subjects discussed by this Commission, the author takes up successively the present state of theoretical interpretation concerning long distance propagation phenomena, a short study of new hypotheses on a phenomenon of stratospheric scatter, certain questions relating to radio meteorology and radio climatology, the conditions of propagation of millimetric waves, and the theory of turbulent diffusion. At the end, are extracts of the resolutions of the Commission. *Subject Headings:* **1. Tropospheric radio wave propagation 2. Radio meteorology 3. Turbulent diffusion.**—*A.V.*

12.6–137 551.510.62:551.510.52

de Belatini, P. C. M. (*Standard Telecommunication Lab., Enfield, Middlesex*), **Inadequacy of scatter mechanisms in tropospheric radio propagation.** *Nature,* London, 184(4698, Supp. No. 20):1558–1559, Nov. 14, **1959.** 2 figs., 3 refs. **DWB**—For a long time the propagation of the radio waves far beyond the horizon was explained as random scattering from dielectric irregularities in the atmosphere. But in the recent years, doubts about this theory have increased. According to any scatter theory a propagated field should be randomly distributed in space and time. But studies show that a spatial field is nonrandom and essentially coherent. *Subject Headings:* **1. Tropospheric radio wave propagation 2. Scatter theories.**—*E.K.* Ⓢ

12.6–138 551.510.535:551.510.62:621.396.1

Southworth, M. P. (*Radio Propagation Lab., Stanford Univ., Calif.*), **Night-time equatorial propagation at 50 Mc/s: first results from an IGY amateur observing program.** *Journal of Geophysical Research,* Wash., D. C. 65(2):601–607, Feb. **1960.** 9 figs., 10 refs., **DLC**—During IGY the American Radio Relay League collected radio amateur reports of 50- and 144-Mc/s ionospheric propagation, evaluated them, and transcribed them onto punched cards. Analysis of 50-Mc/s equatorial intercepts, begun this summer at Stanford University, has revealed three apparently related types of nocturnal, low-latitude propagation: (1) long-range transequatorial, as first noticed by amateurs in 1947; (2) medium-range between stations making transequatorial contacts and stations near the magnetic equator; (3) short-range, similar to sporadic E but occurring regularly with the first two types. Where ever they appear these modes are present almost nightly during certain months, and evening propagation of frequencies up to 1.5 times the maximum daylight MUF is not uncommon. Comparison of transequatorial

results in the Americas and the Far East has shown that seasonal behavior is not same at all meridians. Pronounced negative correlation with magnetic activity is a world-wide feature, however, which suggests a direct relation to equatorial spread F. Quantitative professional data at the frequencies of interest are rather rare, but comparisons with DUENO's backscatter soundings made at the University of Puerto Rico indicate that the 20- and 40-Mc/s transequatorial propagation seen there is not the same as what amateurs experience on 50 to 75 Mc/s. *Subject Headings:* **1. IGY ionosphere program 2. Transequatorial ionospheric radio wave propagation.**—*Author's abstract.* Ⓢ

12.6–139 551.510.62:621.396

Bean, Bradford R., **Climatology of ground-based radio ducts.** *U. S. National Bureau of Standards, Journal of Research, Sec. D,* 63(1): 29–34, July/Aug. **1959.** 7 figs., 3 tables, 8 refs., 17 eqs. **DLC, DWB**—An atmospheric duct is defined as occurring when geometrical optics indicate that a radio ray leaving the transmitter and passing upwards through the atmosphere is sufficiently refracted that it is traveling parallel to the earth's surface. Maximum observed incidence of ducts was determined as 13% in the tropics, 10% in the Arctic and 5% in the temperate zone by analysis of 3 to 5 years of radiosonde data for a tropical, temperate, and Arctic location. Annual maximums are observed in the winter for the Arctic and summer for the tropics. The Arctic ducts arise from ground-based temperature inversions with the ground temperature less than −25°C while the tropical ducts are observed to occur with slight temperature and humidity lapse when the surface temperature is 30°C and greater. *Subject Heading:* **1. Radio wave transmission ducts.**—*Author's abstract.*

12.6–140 621.396.81:551.594.5

Koch, J. W.; Beery, W. M. and Petrie, H. E., **Experimental studies of fading and phase characteristics of high-frequency cw signals propagated through auroral regions.** *U. S. National Bureau of Standards, NBS Report* 6701, June 3, **1960.** 18 p. 72 figs., 12 refs., eqs. **DWB**—Observations of fading and phase characteristics of high-frequency signals have been carried out on a long path (4470 km) passing through the auroral zone. Statistics on fading rates, short-term carrier amplitude variations, fade durations, and phase perturbations have been obtained. Fading rates higher than 20 c/s were observed for a small percentage of time at each of the three carrier frequencies used, and show only a very minor diurnal trend, with the maximum usually occurring during the early morning hours, Rayleigh distributions of carrier envelope amplitude were obtained for many of the observations; however, fading depth was normally reduced during periods of rapid fading. Carrier phase perturbation between 20 millisecond sampling points are quite severe for an appreciable percentage of the time, and increase with fading rate. Phase perturbations for sampling intervals ranging down to one millisecond in length were also obtained, with the indication that phase keying systems might be useful if the phase reference can be reset at intervals of the order of two milliseconds. *Subject Headings:* **1. Radio fading 2. Auroral effects on radio wave propagation.**—*Authors' abstract.* Ⓢ

12.6–141 551.510.62:621.396

†Bean, Bradford R. and Thayer, G. D. (*both, Natl. Bureau of Standards, Boulder, Colo.*), **Models of the atmospheric radio refractive index.** *Institute of Radio Engineers, N. Y., Proceedings,* 45(5, Pt. 1):740–755, May **1959.** 24 figs., 3 tables, 24 refs., 29 eqs. **DWB**—Evaluation of atmospheric refraction effects on UHF-VHF radio propagation has long been accomplished with the convenient four-thirds earth concept of SCHELLING, BURROWS, and FERRELL. This method has proven particularly useful in evaluating performance of point-to-point radio communications systems. However, relatively new long-range applications have demanded a model of atmospheric radio refractive index more representative of observed refractive index profiles than the simple linear decay inherent in the four-thirds earth approach. This paper introduces two models of atmospheric radio refractive index which can be used to predict refraction effects from the value of the refractive index at the transmitting point. Both models offer considerable improvement over the four-thirds earth model, particularly for applications at long distances and high elevations in the atmosphere. Further, both models may be adjusted to represent mean conditions at different times of year and in different geographical locations. A new method of predicting radio-ray refraction at very low initial elevation

angles is introduced which utilizes both the initial value and the initial height-gradient of the refractive index over roughly the first 100 meters above the earth's surface. This method, which is dependent only upon the first two radiosonde reporting levels or simple tower measurements of the common meteorological elements, results in a considerable improvement of the values of ray-refraction predicted by the model. *Subject Headings:* **1. Radio refractive index models 2. Refraction of radio waves. 3. Ray refraction prediction.**—*Authors' abstract.*

12.6–142 551.510.62:621.396

Bean, Bradford R. and Cahoon, B. A., **The effect of atmospheric horizontal inhomogeneity upon ray tracing.** *U. S. National Bureau of Standards, Journal of Research, Sec. D*, 63(3):287–292, Nov./Dec. **1959.** 6 figs., 2 tables, 11 refs., 9 eqs. **DWB, DLC.** Also issued as: *U. S. National Bureau of Standards, NBS Report* No. 6054, April 10, **1959.** 13 p. 6 figs., 2 tables, 10 refs., 9 eqs. **DWB** (621.384 U585ef)—The tracing of radio rays is normally carried out under the assumption that the refractive index varies only in the vertical direction. Although this assumption appears to be quite reasonable in the average or climatic sense, it is seldom satisfied under actual conditions and is strongly violated by horizontal air mass changes occurring near frontal and land-sea interfaces. This latter case is investigated by tracing rays through two instances of observed marked horizontal variation of the refractive index. The bending for these ray paths were then compared with values obtained under the normal assumption of horizontal homogeneity. Although at one kilometer and above these horizontal changes appear to have little effect, rays emitted at low elevation angles are sensitive to extreme horizontal variations of the atmosphere near the surface, such as those associated with ducting conditions. However, since it appears that such conditions occur less than 15% of the time at most locations, the majority of ray path calculations may be carried out under the normal assumption of horizontal stratification of the refractive index. *Subject Headings:* **1. Radio refractive index variations 2. Refraction of radio waves 3. Refractive index inhomogeneities.** —*Authors' abstract.*

12.6–143 551.509.25:551.515.13:551.510.62:621.396.029

Jehn, K. H. (*Univ. Texas*), **Microwave refractive index distributions associated with the Texas-Gulf cyclone.** *American Meteorological Society, Bulletin*, 41(6):304–312, June **1960.** 15 figs., 9 refs. **DWB, DLC**—Microwave refractive-index distributions in the lower atmosphere through the various stages of development of the winter Texas-West Gulf of Mexico cyclone are presented by means of "composite" surface and 850 mb analyses, along with vertical atmospheric cross-sections. The resulting patterns constitute a partial and preliminary synoptic climatology of the subject phenomenon. *Subject Headings:* **1. Microwave refractive index distribution 2. Texas-Gulf cyclone.**—*Author's abstract.*

C. ASTRONOMY AND ASTROPHYSICS

C1. SUN

See also: **Sec. of Cosmic Influences,** p. 1207; **Obs. of solar electron corona** (Newkirk et al.), 12.6–52; **IGY solar activity program, India,** 12.6–54; **Solar storms and space travel** (Lear), 12.6–95; **Cosmic rays and the sun** (Blackett), 12.6–170; **Solar activity and cosmic radiation** (Brown), 12.6–171; **Absorption of cosmic radio noise following solar flare** (Forbush, Burke), 12.6–172; **Cosmic ray increase related to solar activity** (Katzman), 12.6–173; **Ionos. disturbances following a solar flare** (Hill), 12.6–175; **Ionos. F2 layer over India in min. sunspot year 1953** (Ramanathan, Kotadia), 12.6–178; **Correlation between geomag. disturbances and calcium plages** (Mitropol'skaia), 12.6–195; **Atmos. temp. and solar activity** (Ward), 12.6–354.

12.6–144 523.74:550.383:550.385

Berkner, L. V. (*President of URSI*), **The sun's influence on earth and space.** *The New Scientist*, London, 8(200):713–714, Sept. 15, **1960. DLC**—The discoveries made possible by the Pioneer V satellite are outlined and the importance of such experiments as these are stressed. A sketch is then given of the general picture emerging from IGY studies of interplanetary

phenomena. The IGY was chosen to coincide with the maximum of the 22 year sunspot cycle. Rocket observations show that the active regions of the sun are limited in area. The outpouring of particles from the sun produces a magnetic field in space the intensity of which becomes equal to the geomagnetic field at about 40,000 km above the earth. Solar flares emit dense clouds of electrically charged particles into space increasing the strength of the magnetic field. These streams of particles sometimes intersect the earth and cause geomagnetic storms and aurorae. Some very intense solar erruptions emit highly energetic particles which reach the earth in one to four hours and cause radio blackout in advance of the arrival of the slower and less energetic, but more intense cloud of particles which generates the geomagnetic storm. *Subject Headings:* **1. Solar flares 2. Geomagnetic storms 3. Interplanetary magnetic field.** —*R.B.* Ⓢ

12.6–145 523.755:523.036.515:551.510.536

Chapman, Sydney (*Univ. of Alaska and High Altitude Obs., Boulder, Colo.*), **Interplanetary space and the earth's outermost atmosphere.** *Royal Society of London, Proceedings, Ser. A*, 253(1275):462–481, Dec. 29, **1959.** 6 tables, 59 refs., 20 eqs. **DWB, DLC**—The static temperature distribution $T(r)$ in the solar corona is discussed theoretically on the basis of alternative idealized assumptions as to its state θ in particular, for thermal conductive equilibrium and for turbulent adiabatic equilibrium. Up to a distance of 20 solar radii, $T(r)$ is inferred from the electron density data given by BLACKWELL and others. It is concluded that $T(r)$ lies between the conductive and adiabatic distributions. The influence of the rotation of the gas is considered; it does not much affect the inferred $T(r)$ up to 20 solar radii, but ignorance of the rotation at greater distances at present precludes an estimate of the coronal electron density at the earth's distance. The coronal temperature extrapolated to this distance is judged to be of order 100,000°K—a high value, though less than that formerly estimated on the basis of thermal conductive equilibrium. The influence of the hot coronal gas on the earth's outermost atmosphere is discussed, including the conductive heat flow therefrom into our atmosphere. *Subject Headings:* **1. Outer atmosphere 2. Solar corona temperature.**—*Author's abstract.* Ⓢ

12.6–146 523.75:546.291:535.33

Athay, R. Grant (*Univ. Colorado*), **The solar ultraviolet spectrum of He II.** *Astrophysical Journal*, Chicago, 128(2):447–449, Sept. **1958.** 8 refs., eqs. **DWB, DLC**—The observed flux of the λ1640 line is of the order of 0.01–0.06 erg cm^{-2} sec^{-1} at the top of the earth's atmosphere. The HeII line at λ1640 is of particular interest because of the importance of HeII emission in determining the thermal structure of the chromosphere and because of the presence of the HeII line at λ4686 in the chromospheric spectrum at the limb. The resonance line of HeII at λ304 has not been observed but we can estimate its intensity. A note adds that W. A. RENSE has recently obtained rocket photographs of the solar far-ultraviolet spectrum showing the resonance lines of HeII and HeI in emission. *Subject Headings:* **1. Helium in chromosphere 2. Chromospheric spectra 3. Ultraviolet spectra.**—*E.Z.S.*

12.6–147 523.877:535.33:546.11

Cayrel, R. and Traving, G. (*both, Mt. Wilson and Palomar Obs., Carnegie Inst. of Wash., Calif. Inst. of Tech.*), **Zur Frage der Druckverbreiterung der solaren Balmerlinien.** [Pressure broadening of the solar Balmer lines.] *Zeitschrift für Astrophysik*, Berlin, 50(4):239–252, **1960.** 4 figs., table, 22 refs., 21 eqs. English summary p. 239. **DLC**—The wings of H_α–H_δ and their center-limb-variation have been calculated assuming a homogeneous model of the solar photosphere and three different broadening mechanisms: a) purely statistical broadening (HOLTSMARK), b) Holtsmark theory plus electron collisions according to A. C. KOLB and H. R. GRIEM and, finally, c) taking moreover resonance broadening into account. It turned out that the inclusion of electron collisions markedly improved the agreement with observed profiles and that at least for H_α the influence of resonance broadening is also important. Furthermore comparison with observation indicates, that in earlier measurements (C. DE JAGER, **1952**) one had apparently assumed at H_γ and H_δ a position of the continuum too low by about 5%. The influence of temperature inhomogeneities, which was neglected in the numerical

calculation, has been estimated. One should expect, that the depth of the wings increas only slightly if $\Delta T/T$ is of the order of $\pm 5\%$, a value supported by recent measurements of t granulation. *Subject Headings:* **1. Balmer lines 2. Pressure broadening of Balmer lines.**— *Author's abstract.* Ⓢ

12.6–148 551.521.67:550.3

†Mustel', E. R., **O nalichii obshchego polia korpuskul iz Solntsa.** [Existence of a gener corpuscular field from the sun.] *Astronomicheskiĭ Zhurnal*, Moscow, 37(3):396–402, May/Ju **1960.** fig., 29 refs. Russian and English summaries p. 396–397. **DLC.** Trans. into Englis in *Soviet Astronomy AJ*, New York, 4(3), **1960.**—A general definition of the source of corpusc responsible for M-disturbances is given: Almost every active region (including the UM phase even when there is no chromospheric and radio spot activity in it, is a permanent source relatively slow particles, moving inside an approximately radial bundle. According to th definition (based on investigations (1)–(7) the superposed epoch method should give practical identical curves for plages and bright coronal regions in λ5303, because in the projection on th disk (near its center) the coordinates of the active region determined by floccular emissio bright coronal emission in λ5303 and the local magnetic field, coincide. The above definitio of the source of M-corpuscles should be contracted to those hypotheses which do not assum the source of M-disturbances to be active regions (9), (10), (11), (12). Critical remark concerning these hypotheses have been made in (13), (14), (15), (17), (18). The hypothes on the existence of a general intense corpuscular field from the Sun (9), (19), which is closel connected with the problem under consideration, is discussed. The results of (26), (27), (28 are used. In these investigations it is shown that the postulated high concentration of cor puscles in interplanetary space ($n_e \approx 10^3$ cm^{-3} at the distance of the Earth from the Sun) is i contradiction with many facts. Additional arguments in favor of this conclusion are given In particular, the seasonal variations of the normal level of the Earth's magnetic field (betwee disturbances) at the minimum of solar activity in 1954 were of opposite sign to that which shoul have been expected, if it is supposed that the corona plays a large role in producing the genera corpuscular field of the Sun (*see* Fig. 1, where the corona of the solar eclipse of June 30, 1954 i represented). In conclusion it is indicated that, taking all into consideration, a general cor puscular field from the Sun exists, but with concentration less by several orders than tha mentioned above. The acceleration of gases in cometary tails is produced by magnetic field frozen—in corpuscular condensations (22), (17). *Subject Headings:* **1. Corpuscular field from sun.**—*Author's abstract.* Ⓢ

12.6–149 551.521.67:550.385

Mustel', E. R., **O skorostiakh korpuskul v potokakh, sozdaiushchikh M-vozmushcheniia** [Velocity of corpuscles in streams responsible for M-disturbances.] *Astronomicheskiĭ Zhurnal* Moscow, 37(3):403–409, May/June **1960.** fig., 9 refs., 4 eqs. Russian and English summaries p. 403–404. **DLC.** Transl. into English in *Soviet Astronomy AJ*, New York, 4(3):386–391, Nov./Dec. **1960.**—In the present study attention is paid to the important fact that very often (almost as a rule) the time-lag Δt of all the members of any one geomagnetic sequence remains approximately constant. Δt is constant notwithstanding the fact that the physical state of the active region producing the geomagnetic sequence can undergo (during the existence of the latter) exceedingly strong variations (from a very bright plage with intense coronal emission in λ5303 to a unipolar region with floccular emission and bright emission in λ5303). And in general the time of commencement of a disturbance in a sequence, estimated from the formula $t = t_0 + 27^d \times n$, is not connected with the intensity variations of the disturbance itself (taking into account the influence of variations of B_0). At the same time the variation of the physical state of the active region entail considerable variations of the corpuscular velocities v in the stream from one rotation to the next, and thereby lead to very noticeable variations of Δt (see (1)). In connection with the above facts, it is concluded that each corpuscular stream above an active region is an assembly of relatively stable magnetic tubes of force (Fig. 1, 6). This conclusion is in agreement with E. Y. Bugoslavskaya's results (7), which show that straight intense rays emerge from facular regions. In the case under consideration the velocity of motion v of gases along the tubes can be much smaller than the velocity, which is obtained on the basis of calculations (5) according to Δt found from connections between plages and

disturbances. Approximate computations, according to formula (4), show that field strengths of the order of 10^{-4}–10^{-5} gauss are sufficient to carry away (in connection with solar radiation) all the matter in the tubes. The problem of gas velocities in the tubes is considered and arguments are given in favor that in many cases v can actually be small. The question of the appearance and disappearance of the tubes is also discussed. The tubes are apparently formed at the beginning of development of the active region. It is pointed out that the absence of stability in coronal tubes from E and F type active regions can in several cases lead to the absence of M-disturbances from these regions. In the model considered here the main velocity of corpuscles in the stream relative to the earth is the transversal velocity V (*see* Fig. 1, 6) of the order of 400 km/sec. This can (*see* (1) and (3)) also explain the rectangular character of many M-disturbances. Besides, the position of the vector V can apparently give a more natural explanation of the fact that M-disturbances commence in the second half of the day local time. In conclusion several arguments are given in favor that the transversal motion of magnetic tubes should not lead to a noticeable transversal motion of gases in the cometary tails. *Subject Headings:* **1. Solar corpuscules 2. Magnetic disturbances.**—*Author's abstract.* Ⓢ

12.6–150 551.521.67:546.11.02.2

Hayakawa, Satio (*Nagoya Univ.*), **On the origin of deuterium in the solar system.** *Astronomical Society of Japan, Tokyo, Publications*, 12(1):115–116, **1960.** 3 refs., eqs. **DLC**—The observed abundance of deuterium is assumed to be peculiar to our solar system. At a stage of formation of the solar system there occurred a strong outburst of suprathermal particles which irradiated heavy nuclei to produce deuterons. Volatile elements including particularly hydrogen had dissipated before that stage, so that the ratio of deuterium to hydrogen could be as high as the observed one. *Subject Headings:* **1. Corpuscular emissions from sun 2. Deuterium in solar system.**—*Author's abstract.* Ⓢ

12.6–151 551.593.7:523.746

Unno, Wasaburo (*Dept. of Astron., Univ. of Tokyo*), **Comments on Warwick's paper on the formation of absorption lines in a sunspot.** *Annales d'Astrophysique*, Paris, 22(5):430 435, Sept./Oct. **1959.** 2 refs., 23 eqs. French, English and Russian summaries p. 430. **DWB, DLC**—WARWICK's paper published in *Ann. d'Astr.*, 20, **1957** (*see* 10.3–105, March 1959, *Met. Abs.*), is found to be incorrect in his derivation of the transfer equation for the Zeeman components. A set of transfer equations is newly derived in terms of his intensity parameters, and is found to be equivalent to the set of transfer equations derived by the author in terms of the Stokes parameters. Simple examples show that WARWICK's equations are invalid. *Subject Headings:* **1. Zeeman effect 2. Polarization 3. Polarized light.**—*Author's abstract.* Ⓢ

12.6–152 522.1:523.03(789)

Menzel, Donald H.; Smith, Henry J. and Bell, Barbara, **Operation of a Solar Observatory at Sacramento Peak, New Mexico.** Harvard Univ. Harvard College Observatory. Solar Dept., Contract AF 19(604)-146, Final Report, Dec. 22, **1958.** 32 p. **DWB**—An account of the nature of investigations made under the Contract. The routine solar patrol was directed toward obtaining a continuous record of solar activity. Specialized observational research made with the large coronograph gave important new information. Miscellaneous operations included improvement of the photographic laboratory, devising new processing techniques and general collaboration with the IGY. New work has been done in optical engineering and automatic data programming. Solar terrestrial correlation studies and a course in astronomical geophysics were developed; considerable work has been done in the development of astrophysical theory. A total of 55 reports have been issued. A catalogue of solar literature was organized. *Subject Headings:* **1. Solar observatories 2. Sacramento Peak, N. Mex.**—*E.Z.S.*

C2. MOON

12.6–153 551.507.362.1:523.3

Michael, William H., Jr., and Tolson, Robert H. (*both, Langley Research Ctr., Langley Field, Va.*), **Effect of eccentricity of the lunar orbit, oblateness of the earth, and solar gravitational field on lunar trajectories.** *U. S. National Aeronautics and Space Administration,*

Technical Note D-227, June 1960. 37 p. 13 figs., 2 tables, 10 refs., eqs. **DWB, DLC** Comparisons have been made between lunar trajectories which have been calculated by us the classic restricted three-body equations of motion and lunar trajectories (with ident injection conditions) which have been calculated by using equations of motion which incl terms representing the additional effects. The results of such comparisons give an indicat of whether these additional considerations should be included in a trajectory calculation particular lunar missions. *Subject Headings:* **1. Moon rockets 2. Earth figure 3. Gra 4. Moon's revolution.**—*NASA abstract.* Ⓢ

12.6–154 523.5:77

Popova, M. D., **Ob iskrivlenii puti nekotorykh meteorov pri ikh dvizhenii v zem atmosfere.** [The curvature of the paths of some meteors during their motion through earth's atmosphere.] *Astronomicheskiĭ Zhurnal*, Moscow, 37(2):352–353, March/April 19 2 figs. Russian and English summaries p. 352. Transl. into English in *Soviet Astronomy A* New York, 4(2):332–334, **1960. DLC**—The reality of the curvature of the path of so meteors during their motion through the atmosphere has been confirmed for the first time photographic means. The microphotometer tracing taken shows that an actual change in direction of motion of the meteoroid, not its disintegration, is involved. The hypothesis proposed that the inhomogeneity of the meteoroid produced, at a certain height, a change its form which led to the observed curvature of the meteor's path. *Subject Headings:* **1. Mete orbits 2. Meteor photography.**—*Author's abstract.* Ⓢ

C3. METEORS

12.6–155 534.6:551.596.1:523

Isakovich, M. A. and Roĭ, N. A., **Akusticheskiĭ metod izmereniia mekhanicheskiĭ parametrov meteoritov.** [Acoustical method for measuring mechanical parameters meteorites.] *Iskusstvennye Sputniki Zemli*, Moscow, No. 2:81–82, **1958. DLC**—The autho describe an acoustical device reacting to the impact of a meteoric particle, namely; the ballis element which measures the kinetic energy of a particle. This unit must have a separa element of mass and elasticity; the yielding of the elastic element should produce a deformati of sensitive piezo electric elements which in turn produce electric potential. The mechani system must be of low frequency so that oscillations within the mass element would be damp out in a time less than the actual period of the apparatus. In such an apparatus the elastici element together with the associated sensitive piezo electric element will be in a quasi-stat condition and hence the elasticity will have a standard form. The work of this element depen upon the focus of incidence of the particle on the element of mass; if lateral to the center gravity the diaphragm obtains an initial rotation in addition to the initial velocity. T absolute calibration of the element can be obtained by observing the rebound of a sphere known mass falling from a known height. *Subject Headings:* **1. Meteorites 2. Acoustic measurement methods.**—*I.I..D.*

12.6–156 523.531:621.396

Moorcroft, D. R. and Hines, C. O., **Resonance effects in the theory of meteor observabilit** *Canadian Journal of Physics*, Ottawa, 36(1):134–136, Jan. **1958.** fig., 9 refs. **DWB, DLC** This paper reports the successful use of forward scattering of radio waves from meteor trai to determine the "observability" of meteor showers as a function of radiant position. T analysis of meteor shower data from FORSYTH, HINES and VOGAN (1955) and the recer quantitative analysis of the 1956 Quadrantid showers from HINES and VOGAN (1957) revea that the technique is a valuable tool for the study of meteor showers. *Subject Heading* **1. Radio wave scattering theories 2. Meteor shower studies.**—*N.N.*

C4. ECLIPSES

12.6–157 551.501.7:551.510.535:523.78(669

Piggott, W. R. (*Radio Res. Station, Slough, Eng.*), **Ionospheric measurements at Ibada Nigeria during the eclipse of the sun, February 25th, 1952.** *International Council of Scientif Unions. Mixed Commission on the Ionosphere, Third meeting, Canberra, Australia, Aug.* 24–2

1952, *Proceedings*, pub. **1953.** p. 42–50. 2 figs., 5 eqs. **DWB**—During the solar eclipse on 25 Feb. 1952, ionospheric sounding measurements were made at Ibadan. The maximum observation occurred about two hours after sunrise, when maximum density of the layers was increasing. F layer structure here is similar to other places but the F2 layer is more stable. The minimum electron density in the F1 layer occurred before the time of maximum obscuration. The observations proved that ionizing radiation has two components. *Subject Headings:* **1. Ionospheric soundings 2. Eclipse effects on ionosphere 3. Ibadan, Nigeria.** —*A.H.K.*

12.6–158 550.385:523.78

Rikitake, T.; Uyeda, S. et al. (*all, Earthquake Res. Inst. Tokyo Univ.*), **Preliminary report on the effect of the solar eclipse on April 19, 1958 on the geomagnetic field.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 12(2):174–181, June **1958.** 5 figs., table, 6 refs., 2 eqs. **DWB** —Geomagnetic variations associated with the annular solar eclipse on April 19, 1958 are analysed on the basis of the records obtained at Komoro, Aburatsubo and Hachijo-shima Island. The changes observed in the D and H components are in good agreement with the theoretical ones which are calculated by taking into account the decrease in the electrical conductivity of the ionospheric E-layer in the eclipsed area. It is also found that the changes in the Z component are strongly affected by the local underground structure. *Subject Headings:* **1. Solar eclipse of April 19, 1958 2. Geomagnetic variations 3. Japan. I. Yukutake, T. II. Tanaoka, I. III. Nakagawa, E.**—*Authors' abstract.*

12.6–159 551.521.1:523.78

Ramanadham, R. and Subrahmanyam, V. P. (*both, Dept. of Geophysics, Andhra Univ., Waltair*), **Observations of direct solar and diffuse sky radiation during solar eclipse.** *Current Science*, Bangalore, 25(5):167–168, May **1956.** fig., table, ref. **DWB, DLC** —Data and graphs of direct solar radiation, total incoming radiation and diffuse sky radiation during eclipse at Waltair, India (1300–1520 local time) compared with same data for normal December days just before and after eclipse of Dec. 14, 1955, show marked effect of eclipse —a minimum of .37 ly/min at 1320 (eclipse maximum) compared with >.93 ly/min normal for direct, whereas for diffuse sky radiation the minimum is displaced to 1340 owing to change in solar angle (which normally affects the diffuse radiation) being superimposed on eclipse effect. So total incoming radiation minimum is about half-way between (i.e., 1330). *Subject Headings:* **1. Solar radiation during eclipse 2. Eclipse effects 3. Waltair, India.**—*M.R.*

12.6–160 523.78:525.48

Goldstein, A.; Mattingly, O. F. and Heyden, F. J., **On the geodetic application of a solar eclipse.** Georgetown Univ., Wash., D. C. Observatory, Georgetown Observatory Monograph, No. 4; Contract AF 19(604)-880, Technical Report, No. 1, Aug. 1, **1957.** 16 p. 3 figs., 3 refs., eqs.—This theoretical discussion is focused toward reliable determination of the unknown position points in time and space and the interrelated consequences of observer, sun and moon during solar eclipses. The expression ΔR is introduced for the dual error of the terrestrial radius and the distance to the moon, common at all stations and particularly significant towards end of paths. The ΔR would be reduced from ± 0.28 to $\pm .072$ mi hence determine the earth's radius to within ± 0.074 mi provided, respectively, that the positions of the African stations Port Sudan and Libreville were determinable to 3″ of arc; and the distance to moon were known within one mile. This is demonstrated. The accuracies of the photoelectric observations of the solar eclipses of Feb. 25, 1952 and of June 30, 1954 are on par with first order triangulation. *Subject Headings:* **1. Solar eclipses 2. Geodetics.**—*W.N.*

C5. RADIO ASTRONOMY

See also: **Radio noise spectrum** (Menzel., *ed.*), **12.6–1.**

12.6–161 621.396.8:523.164.82:551.510.62

Sarada, K. A. (*Nat. Physical Lab., New Delhi, India*), **Sudden cosmic noise absorption associated with the solar event of March 23, 1958.** *Journal of Atmospheric and Terrestrial*

Physics, London, 13(1/2):192–194, Dec. **1958.** 3 figs., table, 2 refs., 3 eqs. **DLC**—A la absorption effect (SCA) was observed in the records of cosmic radio noise at 30 Mc/s obtai at the National Physical Laboratory, New Delhi, on March 23, 1958. Unusual feature this effect were: indication of an excess absorption some thirty-five times the normal value a residual radiation attributable to the thermal radiation of the lower ionosphere. I possible that a substantial portion of attenuation was caused by processes other than collisio absorption. *Subject Headings:* **1. Sudden cosmic noise absorption 2. Solar flare effects.**—(

12.6–162 551.510.62:621.39

Lotova, N. (*Acad. Scien., U.S.S.R.*), **On estimating the angle of scattering of radio wav** *Soviet Astronomy AJ*, New York, 3(5):881–883, Mar./April **1960.** 3 refs., 3 eqs. Transl original Russian in *Astronomicheskiĭ Zhurnal*, Moscow, 36(5):907–909, Sept./Oct. 19 **DLC**—An expression is derived for the dispersion of the angle of scattering of a plane elect magnetic wave in a statistically nonuniform medium. A discussion is given of the case wh the dispersion of the refractive index is a slow function compared with the dimensions statistical irregularities. *Subject Heading:* **1. Radio wave scattering theories.** *Autho abstract.*

12.6–163 551.510.535:621.39

Balser, M. and Wagner, C. A., **Measurements of the spectrum of radio noise from 50 100 cycles per second.** *U. S. National Bureau of Standards, Journal of Research, Sec.* 64(4):415–418, July/Aug. **1960.** 6 figs., 4 refs., 7 eqs. **DWB, DLC**—Experimental spec of radio noise in the band of about 50 to 100 cycles per second have been obtained by mea of digital processing. Due to the long integration times which were used, the statistic uncertainty in the estimates of power was reduced to about 3 percent (0.13 decibel). It w hoped in this way to observe maximum in the spectrum due to excitation of higher resona modes of the earth-ionosphere cavity (for the accuracy of these data, such peaks should observed if the Q of the cavity were 10 or greater at these frequencies). No statistica significant evidence of these cavity effects was found. *Subject Headings:* **1. Radio noi propagation in ionosphere 2. Radio noise measurement techniques.**—*Authors' abstract.* Ⓢ

12.6–164 621.396.663:522

Some radio telescopes, Pt. 1. *Sky and Telescope*, N. Y., 18(6):302–305, April 195 photos. **Pt. 2.** *Ibid.*, 18(7):370 374, May **1959.** photos. **DWB, DLC**—Photographs a brief descriptions of the radio telescopes at Owens Valley, California Institute of Technolog Stanford University (Palo Alto); Boulder, Colo.; Havana in Illinois, and at Millstone Hi Westford, Mass. *Subject Headings:* **1. Radio telescopes 2. United States.**—*E.Z.S.* Ⓢ

12.6–165 551.521.64:523.164:621.39

Twiss, R. Q. (*C. S. I. R. O., Univ. Grounds, Chippendale, N. S. W.*), **Radiation transfe and the possibility of negative absorption in radio astronomy.** *Australian Journal of Physic Melbourne*, 11(4):564–579, Dec. **1958.** 20 refs., 55 eqs. **DLC**—Stimulated transitions a relatively enormously more probable at radio than at optical frequencies and it is this whic makes it possible for negative absorption to arise at radio wavelengths when the medium wi behave like an amplifier to the incident radiation. A necessary condition for the existenc of this phenomenon is that the kinetic energy distribution $F(\eta)$ of the radiating electrons b markedly non-thermal with an appreciable excess of high energy electrons such that $\partial F/\partial \eta$ positive over a finite range of the kinetic energy η. However, this condition is not sufficient since it is shown that an electron gas in which free-free transitions provide the dominan radiation process can never exhibit negative absorption whatever the form of $F(\eta)$, and it i further necessary that the stimulated transition probability should have a maximum at som finite value of the kinetic energy, the most favourable case occurring when this maximum is a sharp one at the value of η at which $\partial F/\partial \eta$ has a positive maximum. These condition can both be met in principle for the cases in which the dominant radiation process is due (a to Cerenkov effect, (b) to gyro radiation by non-relativistic electrons, (c) to synchrotron-typ radiation by highly relativistic electrons, and it is shown that negative absorption can aris

in all these cases; the relevance of these results to radio astronomy is discussed briefly. *Subject Heading:* **1. Radio astronomy.**—*Author's abstract.*

12.6–166 523.164.3

Heeschen, D. S. (*Nat. Radio Astronomy Obs.*), **Observations of radio sources at four frequencies.** *Astrophysical Journal*, Chicago, 133(1):322 334, Jan. **1961.** 6 figs., 6 tables, 21 refs. **DWB, DLC**—Observations of radio sources at four frequencies in the range 440–8000 Mc are described. To achieve as high internal consistency as possible in the data, the observations were made in the form of ratios to a standard source. Some characteristics of the source spectra derived from the observations are briefly discussed. *Subject Heading:* **1. Radio source spectra.**—*Author's abstract.* Ⓢ

D. OUTER ATMOSPHERE

D1. COSMIC RADIATION

See also: **Study of soft component of cosmic rays** (Vernov et al.), 12.6–105.

12.6–167 551.521.64

Brunberg, E. Å. (*Royal Inst. Tech., Stockholm, Sweden*), **Separation of extra terrestrial variations in cosmic ray intensity and atmospheric effects by differential measurements with G-M telescopes.** (In: Lehnert, Bo Peter (*ed.*), **Electromagnetic phenomena in cosmical physics.** Cambridge, Univ. Press, **1958.** p. 386–391. 3 figs., 2 refs., 5 eqs.) **DLC** (QB461.143)—The daily variation of cosmic ray intensity can arise partly from atmospheric and partly from nonatmospheric effects. There is at present a difference of opinion whether this latter effect is completely due to extra terrestrial causes or not. The purpose of the present paper is to suggest a method by which the atmospheric effects could be separated from the other variations without any assumptions about the mechanism of the atmospheric influence. *Subject Headings:* **1. Cosmic ray variations 2. Atmospheric effects on cosmic rays.** –*Author's abstract.*

12.6–168 551.521.64

†Dorman, L. I. and Feĭnberg, E. L., **Variatsii kosmicheskikh lucheĭ.** [Cosmic ray variations.] *Uspekhi Fizicheskikh Nauk*, Moscow, 59(2):189–228, **1956.** 15 figs., 2 tables, 55 refs., 11 eqs. **DLC, DWB**—A thorough and systematic review of recent native and western results of research on cosmic ray variations in the atmosphere, caused by diurnal, seasonal, long-period, altitudinal, latitudinal, longitudinal, meteorological, geomagnetic, solar cycle and other known factors, with data for each. Variables presented in graphical form and magnitudes of changes summarized for comparative purposes in tabular form. *Subject Headings:* **1. Cosmic ray variations 2. Meteorological effects on cosmic rays.**—*M.R.*

12.6–169 551.521.64/67

†Dorman, L. I., **Svedeniia o solnechnykh korpuskuliarnykh potokakh, poluchaemye iz izucheniia variatsiĭ kosmicheskikh lucheĭ.** [Information on solar corpuscular currents derived from cosmic ray variations.] (In: Akademiia Nauk SSSR. Komissiia po Issledovaniiu Solntsa, **Fizika solnechnykh korpuskuliarnykh potokov i ikh vozdeĭstvie na verkhniuiu atmosferu zemli.** Moscow, **1957.** p. 112–128. 8 figs., 30 refs., 10 eqs.) **DLC** (QB531.A5)—Article discusses methods of investigating temporal variations in intensity of cosmic rays, solar-diurnal variations in cosmic rays in primary currents, effects of cosmic rays connected with geomagnetic activity and with secondary currents, corpuscular currents connected with solar-diurnal anomalies of cosmic rays, geomagnetic and solar activity, etc. *Subject Headings:* **1. Cosmic rays and corpuscular currents 2. Corpuscular emissions from sun.**—*M.R.*

12.6–170 551.521.64:523.75

Blackett, P. M. S. (*Physical Labs., Manchester*), **Cosmic rays and the sun.** (In: Beer, Arthur (*ed.*), **Vistas in astronomy.** pub. London, **1955–1956.** Vol. 2:820–824.) **DWB, DLC** (520.82 B415v)—Constancy of cosmic rays received at the earth's surface gives evidence that

$<\frac{1}{2}$ percent come from the sun. This makes it probable that other similar stars do not ser as sources. At times, for an hour or so, a large intensity of cosmic rays is produced by t sun reaching up to 50% of normal cosmic ray intensity. Four such bursts have occurred the last 10 years (Feb. 28, 1942; March 7, 1942; July 25, 1946 and Nov. 19, 1949.) Characte istics of these sudden cosmic ray storms are described. Relations to large magnetic storn theories of origin, secular changes in diurnal variations, N-S differences in diurnal variatio and relation to 22-year solar cycle are discussed. *Subject Headings:* **1. Solar cosmic ra 2. Cosmic radiation 3. Cosmic ray storms.**—*M.R.*

12.6–171 523.75:551.521.

Brown, Robert R. (*Dept. of Physics, Univ. of New Mexico*), **Solar activity and cosm radiation.** *Journal of Geomagnetism and Geoelectricity*, Tokyo, 9(2):79–85, **1957.** 4 figs 18 refs. **DWB**—Graphs, based on observations at Nagoya, Japan, show nucleonic compone of cosmic ray intensity and sunspot area for Jan.–April 1956, a period of intense solar activit In Jan. and Feb. 1956 the nucleonic component correlates very well with sunspot area (negati correlation) but in March and April the scattering is too great. Thus it is shown that son large solar flares are accompanied by large but brief intensity increases on earth, but sometime by decreases. The event of Feb. 23, 1956 was accompanied by the disk passage of activ regions in the sun—the cosmic ray intensity being negatively correlated with sunspot area i the overall picture, but positively correlated during the intense flare period. Other gre flares or events were Feb. 28, 1942; March 7, 1942, July 26, 1946 and Nov. 19, 1949. *Subje Headings:* **1. Solar-cosmic ray correlations 2. Cosmic ray storms 3. Solar flare, Feb. 2 1956.**—*M.R.*

12.6–172 523.75:551.521.6

Forbush, S. E. and Burke, B. F. (*both, Dept. of Terrestrial Magnetism, Carnegie Institutio of Washington*), **Absorption of cosmic radio noise at 22.2 Mc/sec following solar flare of Feb ruary 23, 1956.** *Journal of Geophysical Research*, Wash., D. C., 61(3):573–575, Sept. 195 fig., 2 foot-refs. **DLC**—A phase-switching interferometer measured the absorption at 22. Mc/s from the radio source Virga A. The intensity on Feb. 23, 1956 at 0430 GMT was les than 0.1 the intensity on Feb. 22, 1956. Cosmic ray intensity showed similar effects. Th measurements were made near Washington, D. C. Comparison with other types of measure ments suggests the absorbing material for 22.2 Mc/s was above the F2 layer and may hav been in the form of a localized cloud. *Subject Headings:* **1. Radio noise 2. Absorptio 3. Cosmic rays 4. Solar flare, Feb. 23, 1956 5. Wash., D. C.**—*S. Fritz.*

12.6–173 551.521.64:523.7

Katzman, J., **A cosmic ray increase related to solar activity.** *Canadian Journal of Physics* Ottawa, 36(7):807–814, July **1958.** 2 figs., 3 tables, 14 refs. **DWB, DLC**—An increase in the intensity of cosmic ray particles of minimum momentum at Ottawa, Canada, of 4.5×10^9 ev/c was observed with telescopes of solid angles 11.5×10^{-4} and 26.0×10^{-4} steradians with increase of solar activity. A large increase in cosmic ray activity for the period September 1956 to February 1957 was observed to accompany a large and sustained increase in solar activity as determined by means of the critical frequency of the F-2 layer. *Subject Headings:* **1. Cosmic ray intensities 2. Solar activity effects on cosmic rays.**—*Author's abstract.*

12.6–174 551.521.64

Nikol'skiĭ, S. I. and Seleznev, V. M., **Distribution of the electron-photon component on the periphery of extensive air showers of cosmic rays.** *Soviet Physics, JETP*, New York, 5(5): 1019–1021, Dec. **1957.** Transl. by H. Kasha of original Russian: **Raspredelenie elektronno-fotonnoĭ komponenty na periferii shirokikh atmosfernykh livneĭ kosmicheskogo izlucheniia,** in *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki*, 32(5):1250–1252, May **1957.** 2 figs., 7 refs. **DLC**—The lateral distribution of the electrons-photon component of extensive atmospheric showers was investigated at an altitude of 3,860 m above sea level with the aid of a setup consisting of a large number of hodoscopic counters. The showers registered were classified into three groups based on the total number N of charged particles in each shower, with the intervals of N being 5×10^5 1×10^5, $1.5\times10^5-2.6\times10^5$, in $5\times10^5-13\times10^5$ particles, while

the mean energy E_0 of the primary particles of these groups comprised respectively 1.6×10^{14}, 5×10^{14}, and 16×10^{14} ev. The functions of lateral distribution of all the charged particles are given for the above groups of showers, as are the results for showers with a number of electrons that are not in equilibrium with μ mesons of 7.4×10^5 and 7.7×10^4. The resultant lateral distribution of the electrons on the periphery of the extensive showers with a total $E_0\sim2\times10^{14}$ ev is in agreement with the electron distribution in a cascade shower, computed by NISHIMURA and KAMATA for the parameter $s=1.2$. The lateral distribution of the electrons in showers with a total energy of $1—2\times10^{15}$ ev is not in agreement with the computation of Nishimura and Kamata for all values of the above parameter s. *Subject Headings:* **1. Cosmic ray showers 2. Cosmic ray electron-photons.**—*Transl. of authors' abstract.*

D2. IONOSPHERE

See also: **Electron density distribution in ionos.**, 12.6–56; **Summaries of papers presented to the IUGG/WMO Ozone Symposium**, 12.6–68; **Artificial sodium clouds** (Blamont), 12.6–188; **Field-aligned ionization** (Mawdsley, Ward), 12.6–210.

12.6–175 523.75:551.510.535:550.385.43

Hill, G. E. (*AVCO Corp. Wilmington, Mass.*), **Ionospheric disturbances following a solar flare.** *Journal of Geophysical Research*, Wash., D. C., 65(10):3183–3207, Oct. **1960.** 5 figs., 15 refs., 3 eqs. **DLC**—Northern Hemispheric charts of f_{min}, foEs, and foF2 at intervals of 3 hours have been constructed for the disturbed period from Sept. 12 through 15, 1957. Enhanced f_{min} values were found over the polar cap on Sept. 12. By the time of the sudden commencement (SC) of geomagnetic activity (0046Z, Sept. 13) the f_{min} disturbance spread outward to the auroral zone. Following the SC, the f_{min} disturbance formed in an elliptical ring around the earth while the polar-cap f_{min} disturbance dissipated. The elliptical ring (coincident with constant dip lines) then expanded southward, and by 0900Z, the approximate time of the main phase, the f_{min} ring disturbance reached a constant dip of about 72°. Just to the north of this ring, in Canada, a crescent-shaped sporadic-E disturbance developed. It also moved southward. Subsequently, a band of sporadic E appeared over northern Asia. The foF2 disturbance began about the time of the SC and lasted about 36 hours. On the basis of the f_{min} and foEs patterns, it is concluded that, prior to the SC, solar corpuscles impinge on the lower ionosphere directly from outside the earth's 'magnetosphere.' The post-SC f_{min} and foEs disturbances are attributed to trapped radiation drifting at relatively low altitudes (below about 2000 km). The southward expansion of the disturbances is a result of the strengthening of the solar stream. *Subject Headings:* **1. Solar flare effects on ionosphere 2. Ionospheric disturbances 3. Sudden commencements.**—*Author's abstract.* Ⓢ

12.6–176 551.510.535(47)

*Mednikova, N. V., **Ionosfernye vozmushcheniia v srednikh shirotakh.** [Ionospheric disturbances in middle latitudes.] (In: Akademiia Nauk SSSR. Komissiia po Issledovaniiu Solntsa, **Fizika solnechnykh korpuskuliarnykh potokov i ikh vozdeĭstvie na verkhniuiu atmosferu zemli.** Moscow, **1957.** p. 183–245. 34 figs., 18 tables, 21 refs.) **DLC** (QB531.A5)—Hourly anomalies in foF2 at Moscow are tabulated for each month of 1948 and February 1949 (and for other periods at other places), and are analyzed to show nature and intensity of disturbances with respect to solar and sidereal time, seasons, solar disturbances at different latitudes and longitudes. Extensive tables of data for Leningrad, Moscow, Sverdlovsk, Irkutsk and Alma Ata, and for foreign stations for 1948 and 1949, and 1952 and 1953 from 40° to 60°N. Numerous examples of, and types of disturbances are shown graphically. The application of this analysis to radio propagation problems and forecasting radio propagation conditions is mentioned. *Subject Headings:* **1. Ionospheric disturbances in mid-latitudes 2. foF2 disturbances 3. U.S.S.R.**—*M.R.*

12.6–177 551.510.535:551.594.12:551.507.362.1

Martyn, D. F. (*Radio Res. Lab., C. S. I. R. O., Camden, N. S. W.*), **Processes controlling ionization distribution in the F2 region of the ionosphere.** *Australian Journal of Physics*,

Melbourne, 9(1):161–165, March 1956. 5 refs., 5 eqs. **DLC**—All indications point to t reliability of established atmospheric densities (10^{10} particles per cc) at 300 km level, rath than to the values (about 30 times less) obtained by recent rocket soundings. If the latt were correct, the F2 region would lower shortly after sunset to well below 300 km, which is n the case. Hence there must be a systematic error in density measurements by rockets great heights. The results of a thorough investigation into the effects of diffusion processes F2 layer are presented under the headings of: 1) speed of diffusion of ionization under gravit and partial pressure gradient, 2) formation of stable Chapman regions by diffusion and 3) fo mation of stable Chapman regions by combined action of diffusion and attachment gradien and 4) interpretation of equatorial anomalies and parabolic shape of F2 region. *Subje Headings:* **1. F2 layer ionization distribution 2. Air density 3. F2 layer diffusion processe 4. Rocket soundings.**—*M.R.*

12.6–178 551.510.535:523.746(54

Ramanathan, K. R. and Kotadia, K. M. (*Phys. Res. Lab., Ahmedabad*), **The ionospheri F2 layer over India in minimum sunspot year 1953.** *Indian Journal of Meteorology and Geo physics*, Delhi, v. 5, Spec. No.:117–122, Dec. **1954.** 8 figs., 2 tables. **DWB**—Facts relatin to the F2 layer in the ionosphere over India are summarized. First a brief summary is give of the Ahmedabad data from the year 1953, and then the data of other Indian stations i compared. The other stations are at Delhi, Bombay, Madras, Tirnchy, Kodaikanal an Calcutta. Data for all the 24 hours are available only for Ahmedabad and Delhi. Th relative sunspot numbers in 1953 are tabulated and the main features of foF2 daily and seasona curves are discussed and graphically represented. *Subject Headings:* **1. F2 layer 2. Sunspo numbers 3. F2 layer-sunspot relationships 4. India.**—*I.S.*

12.6–179 551.506.7:551.510.53

*Agy, Vaughn; Davies, Kenneth and Salaman, Roger, **An atlas of oblique-incidenc ionograms.** *U. S. National Bureau of Standards, Journal of Research, Sec. D*, Wash., D. C. 65(1):35–36, Jan./Feb. **1961.** fig., 5 refs. **DWB, DLC.** Also issued as *U. S. National Bureau of Standards, Technical Note*, No. 31, Nov. **1959.** 3 sections separately paged. Numerous charts. **DWB**—An atlas providing a compilation of records of a type becoming standard in the field of ionospheric research, and presenting records which are characteristic of the specific paths used by the N. B. S. The sweep-frequency experiments have been carried out over two approximately east-west paths: Sterling, Va.–St. Louis, Mo and Sterling, Va.–Boulder Colo. The atlas is organized into three parts, giving examples of records made: 1) over the Sterling–St. Louis (1150) path, 2) over the Sterling–Boulder (2370 km) path during the routine phase of this part of the experiment and 3) over the Sterling–Boulder path during the more recent phase of the experiment in which equipment changes were made to increase the observable detail in the ionograms and to make measurements of recorded pulse amplitudes. *Subject Headings:* **1. Oblique incidence ionogram atlases 2. Sweep frequency experiments.** —*I.S.* Ⓢ

12.6–180 551.510.535:551.510.62:621.396.1

Budden, K. G., **The mathematics of wave propagation through the ionosphere.** (In: Physical Society, London, **Physics of the ionosphere.** London, Physical Society, **1955.** p. 276–287. fig., table, 21 refs., 15 eqs.) **DWB**—Introduction to Pt. IV of the Conference. The purpose of this survey is to provide an introduction to the subjects to be treated and includes: the Appleton-Hartree formula, the statistical mechanics of the ionosphere, the vertical incidence studies of the ionosphere, the reflection of oblique incident waves: the Booker quartic, the ray tracing in the ionosphere, the full wave solutions, coupled wave equations, the impulse response of the ionosphere. The Addendum deals with three topics: 1) the use of data from ionospheric observing stations, 2) the limiting polariazation of downcoming radio waves and 3) the statistical mechanics of the ionosphere. *Subject Headings:* **1. Radio wave propagation through the ionosphere 2. Physics of the ionosphere 3. Radio wave propagation mathematics.**—*E.K.*

12.6–181 551.510.535:551.510.62:621.396.1

LaTourrette, P. M., **Reduction and processing of F-layer propagation data.** Stanford University, Radio Propagation Laboratory, Contract AF 19(604)-1830, Scientific Report No. 4, Dec. 15, 1958. 68 p. numerous figs., 15 refs., eqs.—For many years frequency predictions have been issued for radio propagation via the F layer. It is a matter both of interest and importance to be able to compare these predictions with experimental observations. Backscatter soundings taken recently at Stanford University prove to be quite adaptable to this type of work. In this report data from the backscatter records have been compared with the Central Radio Propagation Laboratory frequency predictions for the same period. Information scaled from Stanford's vertical incidence sounder has also been included in the comparisons. A considerable amount of experimental data was used, and the task of reducing it was simplified by extensive use of Stanford's data handling facilities. *Subject Headings:* **1. Radio wave propagation 2. Data processing.**—*Author's abstract.*

12.6–182 551.510.535:551.510.62:621.396.1:016

†Ratcliffe, J. A., **A survey of existing knowledge of irregularities and horizontal movements in the ionosphere.** (In: Physical Society, London, **Physics of the Ionosphere,** London, Physical Society, **1955.** p. 88–98. 65 refs.) **DWB**—Introduction to Pt. II of the conference. The various aspects include: ionospheric irregularities, sizes of the irregularities, average drift movements, irregular movements, propagation by scattering from ionospheric irregularities, the fading of radio waves, theories of movements, causes of the irregularities. In the attached bibliography the papers are listed under the main headings of the survey and occasionally under sub-headings; titles of the papers are given. *Subject Headings:* **1. Physics of the ionosphere 2. Ionospheric research bibliographies.**—*E.K.*

12.6–183 551.510.535:546.33:535.33

Manring, E. R. and Bedinger, J. F. (*Air Force Cambridge Research Ctr., L. G. Hanscom Field, Bedford, Mass.*), **Sodium emission at 140 km.** *International Astronautical Congress, 8th, Barcelona, 1957,* **Proceedings,** issued Vienna, **1958.** p. 153–156. 2 tables, 6 refs., eqs. English, German and French summaries p. 153. **DLC** (TL787.I44)—The efficiency of chemiluminescent processes occurring at night between atmospheric constituents and sodium atoms has been determined by releasing known amounts of atomic sodium in the form of a filament from 50 to 140 km. Photometric and photographic recordings indicate that a strong persistent glow occurs at about 90 km as expected; that above 105 km the process becomes inefficient; and that above 130 to 140 km, the rocket's zenith, a different process yields a strong emission of 5890 Å radiation. It is proposed that this last process is due to transfer of energy from atmospheric atomic nitrogen in the highly metastable ^2D state to the released sodium. *Subject Heading:* **1. Sodium emission variations.**—*Authors' abstract.*

D3. AURORAS AND NIGHT AIRGLOW

See also: **Geomag. storms and the space around the earth** (Chapman), 12.6–196.

12.6–184 551.594.5:771.3

Elvey, C. T. and Belon, Albert, **Description of the all-sky camera, its method of operation: an instrument (ascagraph) for measuring the film.** Alaska. Univ. Geophysical Institute, Grant NSF Y/1.1/44, Scientific Report, No. 1, [**1959?**]. 43 p. 18 figs. (including photos), 3 refs. **DWB**—A detailed, illustrated description of the all-sky camera, its installation and operation. The processes of film development, inspection and preliminary assessment are explained. The need for synoptic maps is met by the use of the auroral plotter (Ascagraph) for reduction of photographs. The preparation of synoptic maps is illustrated and explained. *Subject Headings:* **1. All-sky auroral camera 2. Auroral plotter (Ascagraph).**—*E.Z.S.* Ⓢ

12.6–185 551.501:551.594.5

†Jarrett, A. H. (*Univ. Obs., St. Andrews, Scotland*), **Techniques in auroral investigations.** (In: Beer, Arthur (*ed.*), **Vistas in Astronomy,** Vol. 3, pub. **1960.** p. 117–125. 4 figs., 28 refs.) **DWB** (520.82 B415v), **DLC** (QB3.B35)—The greatly increased interest shown in auroras,

chiefly as a result of the International Geophysical Year, and the techniques associated with auroral research are discussed. *Subject Heading:* **1. Auroral observation techniques.**—*Author's abstract.* Ⓢ

12.6–186 551.521.326:535.3

Chiplonkar, M. W. and Kulkarni, P. V. (*both, Dept. of Physics, Univ. of Poona, India*) **Contamination of the intensities of the oxygen lines by the neighboring OH emission bands in the night airglow.** *Journal of Geophysical Research*, Wash., D. C., 64(10):1641–1642, Oct. 1959. 7 refs. **DLC**—The significance of emission of OH bands in the upper atmosphere was indicated during investigations of the night airglow at the Dept. of Physics, University of Poona. The discrepancies between heights of λ6300Å and λ5577Å emission layers, obtained from observations in the higher latitudes and in the tropics, can be explained by taking into account the effect of contamination deriving from OH emission bands in the upper atmosphere, supposing that the OH emission is greater and more variable in the higher latitudes. *Subject Headings:* **1. Oxygen lines 2. Night airglow emission.**—*O.T.* Ⓢ

12.6–187 551.593.55:546.34:535.33:551.506.22(99)

Delannoy, J., **Sur les observations crépusculaires de la raie du lithium au cours de l'Année Géophysique Internationale.** [Twilight observations of the lithium line during the International Geophysical Year.] *Annales de Géophysique*, Paris, 16(2):236–252, April/June 1960. 12 figs., 20 refs. French, English and Russian summaries p. 236–237. **DLC**—The purpose of the present paper is to present and discuss a series of observations made at the French station Dumont d'Urville in Adélie Land (66°40′S–140°01′E) during the IGY. A model for the interpretation by means of a layer, limited towards low altitudes and increasing exponentially upwards, is also proposed: a) Despite the scarce data, the curve of the variation of the luminous intensity at 6708 Å as a function of the solar depression agrees fairly well with the theoretical curve. This one is deduced from the diffusion mechanism, through resonance, of the solar energy existing at 6708 Å in the lighted layers of the atmosphere at twilight. More particularly the parallelism of this variation with that of the D_1 and D_2 sodium lines is emphasized. The curves lead to the evaluation of the altitude of the Li and Na layers at respectively 80 and 90 km. b) For the intensities observed at 6780 Å, the phenomenon of reabsorption through resonance practically does not interfere. c) The ratio N(Li)/N(Na) of the numbers of neutral atoms of lithium and sodium (in this last case the reabsorption through resonance is important) was in August–September 1957, in the vicinity of the observation point, in the range of $7 \cdot 10^{-4}$, and seems to have decreased from August to September 1958 in the ratio of 8 to about 1 (around the value $8 \cdot 10^{-3}$, order of magnitude). d) The whole of these data is not in contradiction with Barbier-Delannoy-Weill hypotheses nor with those of the American IGY Committee following which the lithium observed in August–September 1958 should proceed from thermonuclear tests at high altitude (Johnston Island, Aug. 12, 1958). New observations, with appropriate equipment are, in our opinion, necessary to know in what proportion the observed phenomenon is natural. *Subject Headings:* **1. Twilight lithium spectrum 2. Lithium lines 3. International Geophysical Year 4. Dumont d'Urville, Antarctica.**—*Transl. of author's French summary.* Ⓢ

12.6–188 551.510.535:546.33:535.33

Blamont, J. E., **Nuages artificiels de sodium : diffusion multiple de la lumière de résonance.** [Artificial sodium clouds: multiple diffusion of resonance light.] *Académie des Sciences, Paris, Comptes Rendus*, 250(3):567–569, Jan. 18, **1960.** 2 figs., 3 refs. **DWB, DLC**—Important multiple diffusion occurs in sodium clouds. The properties of the light emitted (width of line, ratio D2/D1, polarization) are modified with regard to what they would be in the absence of multiple diffusion. If one disposes of a theoretical model, the measure of this modification makes it possible to measure k1, i.e., the concentration in sodium atoms at each point and for each moment. The transfer of radiation in the theoretical model is described by an equation with partial derivatives obtained through a generalization of Milne's theory. The solution, in the case of conditions with limits adapted to the problem, provides the number of sodium atoms excited by cm^3. A figure shows the variation of concentration in sodium atoms as a function of the intensity ratio D2/D1. The author gives the characteristics of the inter-

ferometer used for the measurement and describes briefly the method of determining the width of the line. The measurements give evidence of the multiple diffusion, prove the value of the theoretical model, make it possible to determine the number of atoms by cm^3 and show that the determination of temperature in the upper atmosphere is possible through measuring the width of the line. *Subject Headings:* **1. Sodium in upper atmosphere 2. Sodium D line emission 3. Artificial sodium clouds.**—*A. V.* Ⓢ

12.6–189 551.521.326:546.33:535.33

†Donahue, T. M. (*Univ. of Pittsburgh, Pa.*), **Sodium in the earth's upper atmosphere.** *Journal of Applied Physics*, N. Y., 30(1):34, Jan. **1959.** 17 refs. **DLC**—The D lines of sodium are a prominent feature of the spectrum of the night and twilight airglow. It seems possible that the sodium layer can vary in altitude between 70 and 100 km and that the ozone layer rises and falls along with the sodium or perhaps that one or the other of both layers vary in altitude radically from day to day and from point to point geographically. Additional observations reveal a great east-west asymmetry in sodium abundance. The indications are that the ocean has a large and rather direct influence on the sodium in the upper air. *Subject Headings:* **1. Night airglow spectra 2. Sodium D line 3. Ozone layer height.**—*E.Z.S.* Ⓢ

12.6–190 550.389.5(493)

Lahaye, E.; Koenigsfeld, L.; De Vuyst, A. and Hoge, E., **Nouveau levé magnétique de la Belgique.** [Recent magnetic survey of Belgium.] *Belgium. Institut Royal Météorologique, Publications, Ser. A*, No. 5, **1957.** 95 p. 7 figs., 4 tables, 3 charts. **DLC**—The authors explain the manner in which the recent magnetic survey was made during the period 1952–1955. The work consists of two parts: 1) Determinations of H and Z (by means of 2 QHM and 2 BMZ), for about 600 places spread in a homogeneous manner at the rate of one station every 50 km^2. Besides this, a hundred supplementary places have been occupied in the regions which are the seat of magnetic anomalies. 2) Measurements of D in 181 places, most of which belong to the statement undertaken by A. Hermant in the years 1911 to 1914. Three charts are included, showing Z, H and D isodifferences between Dourbes and each station. These charts show several regions with magnetic anomalies (Flanders-Brabant-Campine-Ardennes) and indicate subsequently the irregular distribution of the magnetic elements in Belgium. *Subject Headings:* **1. Geomagnetic surveys 2. Magnetic charts 3. Belgium.** —*A. V.*

12.6–191 550.384.6(493)

Koenigsfeld, L., **Les anomalies de la variation séculaire du champ magnétique terrestre en Belgique de 1913 à 1957.** [The anomalies of the secular variation of the earth's magnetic field in Belgium from 1913 to 1957.] *Belgium. Institut Royal Météorologique, Publications, Ser. A*, No. 13, **1960.** 6 p. 2 charts, 4 foot-refs. **DLC**—The magnetic map of Belgium was drawn the first time in 1911 by A. Hermant and the second time in 1957 by E. Lahaye, L. Koenigsfeld, A. De Vuyst and E. Hoge. A short description is given of the instruments used for the two surveys. Comparison of the results yielded by these two efforts made it possible to work out the secular variation for the whole of Belgium. Comparison being difficult for the horizontal and vertical components, the author investigated only the secular variation of the declination. In 1957, the observations were made at the same places or in a vicinity close to those where the 1911 measurements were made. The differences of the declination between Uccle and each of the stations for the 1911 and 1957 maps are tabulated. These data were used to draw a chart (Fig. 1) which shows the anomalies of the secular variation of the earth's magnetic field in Belgium from 1913 to 1957. It is granted, as a rule, that the secular variation is a linear function of latitude and longitude; from this one should conclude that over the entirety of the Belgian territory the secular variation should be almost identical with a slight increase from E to W. Contrary to this commonly accepted idea, the secular magnetic variation seems to be linked, in Belgium, with the magnetic anomalies, for the discrepancies of the secular variations coincide with the magnetic anomalies. *Subject Headings:* **1. Geomagnetic field anomalies 2. Geomagnetic secular variations 3. Secular variation of geomagnetic declination 4. Belgium.**—*A. V.*

D4. GEOMAGNETISM

See also: **Ionos. disturbances following a solar flare** (Hill), 12.6–175; **Geomag. fluctuations and the Van Allen radiation belt** (Parker), 12.6–205; **Effect of magnetic storm upon outer Van Allen belt** (Malville), 12.6–206.

12.6–192 550.385.2(669

*Onwumechilli, C. A. and Alexander, N. S. (*both, Physics Dept., Univ. College, Ibadan, Nigeria*), **Variations in the geomagnetic field at Ibadan, Nigeria, Pt. 1, Solar variation.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 16(1/2):106–114, Oct. **1959.** 4 figs., 2 tables, 10 refs. **Pt. 2, Lunar and luni-solar variations in H and Z.** *Ibid.*, p. 115–123. 3 figs., 3 tables, 10 refs., eq. **DWB, DLC**—Magnetic records obtained at the recently established magnetic observatory at Ibadan in equatorial Africa for the period November 1955 to June 1957 are analyzed harmonically for solar variations. The results, given in the form of harmonic dials, show that the amplitude of H is very large (similar to that observed at Huancayo), and the amplitude of Z is larger by a factor of 3 than any previously reported. These results are explained as arising from the equatorial electrojet centered on the magnetic equator which is about $2\frac{1}{2}°$N of Ibadan. The variation in D at Ibadan is small, but has its phase completely reversed between the June and December solstices. The D-variation shows no obvious effect of the electrojet. In Pt. 2, magnetic records obtained from November 1955 to June 1957 at Ibadan, Nigeria, have been analyzed harmonically for lunar and luni-solar variations. The results are statistically significant. The L-variations in H and Z are abnormally large at Ibadan. The L-variation in H is comparable with that of Huancayo and about three times greater than at other observatories of comparable geographic latitude. The L-variation in Z is larger than any previously reported. These results are explained as the effect of the equatorial electrojet. The ratio of S to L in H is small at Ibadan as at Huancayo. S/L in Z is equally small at Ibadan (Ibadan happens to be near the latitude where the Z effect of the electrojet is a maximum (Onwumechilli, 1959). The Chapman (1913) expression for L is fully confirmed in all aspects. *Subject Headings:* **1. Geomagnetic field variations 2. Lunar diurnal magnetic variations 3. Solar diurnal magnetic variations 4. Ibadan, Nigeria.**—*Authors' abstracts.* Ⓢ

12.6–193 662.2:539.1:550.375:550.385

Eschenbrenner, S.; Ferrieux, J.; Godivie, R. R. et al., **Analyse expérimentale des effets magnétiques et telluriques de "l'Expérience Argus" enregistrés par les stations françaises.** [Experimental analysis of the magnetic and telluric effects of the "Argus Experiment" as recorded by French stations.] *Annales de Géophysique*, Paris, 16(2):264–271, April/June **1960.** 19 plates, table, 4 refs. English and Russian summaries p. 264. **DLC**—The "Argus Experiment"—three high-altitude small nuclear detonations which were fired at about 480 km of height above the South Atlantic Ocean—produced artificial magnetic and telluric perturbations of the Earth's field, which were received very distinctly at six French stations widely spread over the Earth between France and the Antarctic Continent. Compared with the documents already published by the American organizers of the Experiment, these registrations bring to light the unexpected fact that pulsed magnetic signals as those which were originated by the detonations (a dozen irregular oscillations, about one to three seconds in periods), can travel at great speed and without much attenuation in every direction, across or along the Earth's magnetic field lines. For this reason, and as a start for subsequent studies, a detailed computation of the signals as they were recorded, has been reported here. Three tables, followed by photographic reproductions of the original records, are included. *Subject Headings:* **1. Nuclear explosion effects 2. Hydromagnetic waves 3. Argus Experiment 4. Geomagnetic disturbances 5. Telluric currents. I. Lachaux, R. II. Larzillière, H. III. Lebeau, A. IV. Schlich, R. V. Selzer, E.**—*Authors' abstract.* Ⓢ

12.6–194 662.2:539.1:550.385.3

Lawrie, J. A.; Gerard, V. B. and Gill, P. J. (*all, Magnetic Survey, Dept. of Sci. and Ind. Research, New Zealand*), **Magnetic effects resulting from two high-altitude nuclear explosions.** *Nature*, London, 184(4688):34, 51–52, Sept. 5, **1959.** fig., 4 refs. **DWB**—The two high

altitude nuclear explosions of Aug. 1 and 12, 1958 had horizontal magnetic effects as well as a distortion of the earth's horizontal magnetic field and this in turn affected the cloud and electric current systems of the atmosphere. A study of the vector diagrams of the variations of the magnetic effects has led to a classification of these effects into the initial, second, main and final phases. Each of these phases is discussed in detail. *Subject Headings:* **1. Nuclear explosion effects on magnetism 2. Magnetic disturbances.**—*N.N.* Ⓢ

12.6–195 550.385.4:523.74:523.854.12

Mitropol'skaia, O. N. (*Acad. of Sci., U.S.S.R.*), **The correlation between the geomagnetic disturbances of 1950 and calcium plages.** *Soviet Astronomy AJ*, New York, 3(4):601–605, Jan./Feb. **1960.** 2 figs., 7 refs. Transl. of original Russian in *Astronomicheskiĭ Zhurnal*, Moscow, 36(4):616–619, July/Aug. **1959. DLC**—The correlation between geomagnetic disturbances (March–Dec. 1950) and Ca^+ plages, which passed across the center of the solar disc or near it, was studied. For the same period a statistical curve was obtained by the method of superposed epoch. This curve confirms the results of the individual correlations. The geomagnetic disturbances lag behind the CMP of the plages by 3.5 days on the average and the maximum of geomagnetic activity is at phase $+5^d$. The same follows from Table 1 of Waldmeier's paper if the indices C are used. The introduction of indices $C^{\mp}$ and $p^{\mp}$ does not seem to be justified. A shift of curves as shown in Fig. 2 is due to the decrease of the velocity of corpuscles toward the minimum of solar activity. *Subject Heading:* **1. Geomagnetic storm—calcium plage relationships.**—*Author's abstract.* Ⓢ

12.6–196 551.594.5:523.74:550.385.4

Chapman, Sydney (*High Altitude Observatory, Boulder, Colo.*), **Geomagnetic storms and the space around the earth.** *Nature*, London, 187(4740):824–827, Sept. 3, **1960. DWB, DLC**—This paper is a brief review and history of observation and research on geomagnetic storms and their association with aurora. The 27 day recurrence of geomagnetic storms and their association with the sunspot cycle was recognized during the latter half of the 19th century. Birkeland and Stormer developed a theory relating magnetic storms with the aurora polaris ascribing them to streams of solar electrons of the same sign. This theory was criticized and replaced by the theory of a stream of neutral but ionized gas in the early part of this century based mainly on the work of Chapman and Ferraro. In 1957 Singer introduced the conception of energized particles moving around the Earth's dipole lines of force which was confirmed by the discovery of the Van Allen radiation belts. A description is given of some of the properties of these belts as revealed by rocket and satellite work. At present there are a diversity of theories of the auroral luminosity and the electric currents associated with it. Almost all involve the now proved entry into the ionosphere of electrons from space. A short discussion of these theories is given. *Subject Headings:* **1. Geomagnetic storms 2. Van Allen belts 3. Auroral-geomagnetic relationships 4. Auroral theories.**—*R.B.* Ⓢ

12.6–197 550.385.4:517.512.2

Sugiura, Masahisa (*Univ. Alaska*), **A note on harmonic analysis of geophysical data with special reference to the analysis of geomagnetic storms.** *Journal of Geophysical Research*, Wash., D. C., 65(9):2721–2725, Sept. **1960.** 2 figs., 4 refs., 9 eqs. **DLC**—Some geophysical characteristics tend to have a fixed distribution relative to the sun. An example is the distribution of air temperature on an ideal earth that is perfectly symmetrical (e.g., in its pattern of land and water) about its axis of rotation. In such a case the geophysical characteristic at any fixed station on the earth undergoes a daily variation that depends only on local time (and latitude and season). This simple pattern of daily change may be modified by intrinsic changes in the solar influences on the earth. The harmonic components of the daily variation at any station may then undergo phase changes, causing frequency shifts, in some respects corresponding to doppler shifts of frequency in optical or sonic phenomena. Care is then needed if the results of harmonic analysis are to be properly interpreted. Such interpretation is discussed with reference to the parts Dst and DS of the magnetic storm variations. Like caution must be observed if the amplitude of a harmonic variation changes with fixed phase. *Subject Headings:* **1. Geomagnetic storms 2. Geophysical data analysis.**—*Author's abstract.* Ⓢ

12.6–198 551.510.535:551.594.12:550.38

Haubert, A., **L'ionisation nocturne de la région-E et l'activité géomagnétique.** [Nocturn ionization in the E region and geomagnetic activity.] *Journal of Atmospheric and Terrestri Physics*, London, 15 (1/2):84, Sept. **1959.** French summary p. 84. **DLC**—A good correlatic between the appearance of a thick layer at night below the *F* region, and an increase of magnet activity was found at Casablanca. A similar observation was made at the station of Fribou in 1957. This phenomenon would merit study on a global scale. *Subject Headings:* **1. Noctu nal E layer ionization 2. Geomagnetic-ionospheric relationships.**—*Transl. of author's abstra (O.T.)* Ⓢ

12.6–199 550.380.23(437,438

Bucha, Václav and Kočí, Alois, **Uviazka osnovnykh seteĭ ChSR i PNE** [Connecting basic geomagnetic networks in Czechoslovakia and Poland.] *Geofysikál Sborník*, Prague, 1958, issued **1959.** p. 263–276. 2 figs., 2 tables, 9 refs., eqs. Czech an English summaries p. 274–275. **DWB**—Connection of the basic network of the horizontal an vertical components of geomagnetic intensity between Czechoslovakia and Poland was con pleted in 1957. Measurements were made with QHM and BMZ instruments, knife-edge an torsion fiber balance along the frontiers of the two countries at 23 stations. The topograph of this area is described. Data were reduced according to the magnetic recordings of th Pruhoniče, Hurbanovo and Świder observatories. The results are tabulated. *Subject Hea ings:* **1. Geomagnetic networks 2. Czechoslovakia 3. Poland.**—*E.Z.S.*

12.6–200 550.382.

Pospelova, G. A., **Ostatochnaia namagnichennost' tretichnykh i chetvertichnykh izver zhennykh porod.** [Remanent magnetization of Tertiary and Quaternary igneous rocks. *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 11:1591–1598, Nov. **1959.** 8 figs., 2 table 7 refs. Russian summary p. 1591. **DLC.** Transl. into English in the corresponding numbe of its *Bulletin of the Academy of Sciences, USSR, Geophysics Series.* **DLC**—Using residua magnetization of igneous rocks of different regions, the geological history of the changing magnetic pole of the earth is studied. The study used rocks from Armenia, Kuril Island and Kamchatka. Most of these rocks contained small particles of ferromagnetic substances magnetite, pyrrhotine, gematite, etc. Thermoresidual magnetization is generally directed to the magnetic pole of the Earth at the period of rock formation, therefore in the rocks o known geological period the direction of the pole can be found. Geological structure of the rocks of different regions are discussed in view of sampling and determination of their residua magnetization The specimens of the Quaternary rocks were found to be magnetized normally but the rocks at the end of the Pliocene Period are magnetized differently (opposite way) Positions of the earth's magnetic pole were computed on the basis of tabulated data and plotted on the map. The results were found very close to data of other investigations. Also the geological age of the rock may be indicated by the vector of residual magnetization. *Subject Headings:* **1. Magnetization of rocks 2. Remanent magnetization.**—*N.P.S.*

D5. VAN ALLEN BELTS

See also: **Magnetic and telluric effects of Argus Experiment** (Eschenbrenner et al.), 12.6–193; **Magnetic effects resulting from nuclear explosions** (Lawrie), 12.6–194; **Correlation between geomag. disturbances and calcium plages** (Mitropol'skaia), 12.6–195; **Geomag. storms and the space around the earth** (Chapman), 12.6–196.

12.6–201 551.521.64

Freden, Stanley C. and White, R. Stephen (*all, Univ. California*), **Particle fluxes in the inner radiation belt.** *Journal of Geophysical Research*, Wash., D. C., 65(5):1377–1383, May **1960.** 4 figs., 15 refs., 9 eqs. **DLC**—Using the albedo neutron decay source, the energy spectrum of trapped protons in the inner belt has been calculated from 10 to 700 Mev. This calculation differs from those of Singer and Hess in that a nuclear interaction term, in addition to the energy loss term, has been used in the continuity equation for the steady-state condition. The spectrum agrees well with the published data. This agreement is strong evidence for the albedo neutron decay source. It also indicates that nonadiabatic losses are small for the

particles measured here. A second small stack of nuclear emulsions was flown at the lower edge of the inner radiation belt 11 days after the large solar flare of May 10, 1959. The ratio of the proton flux measured on the second flight to that on the first one is 0.8 ± 0.1, indicating that the solar flare had little or no effect on the proton content of the inner belt. A flux of 2 ± 1 tritons/cm^2 sec between 126 and 200 Mev was observed; it is attributed to collisions of trapped protons with air nuclei. No other nuclei heavier than protons were seen. *Subject Heading:* **1. Van Allen belts.**—*Authors' abstract.* Ⓢ

12.6–202 551.521.64

Trapped radiation around the earth. *Current Science*, Bangalore, 28(6):229–230, June 1959. fig. **DWB, DLC**—A brief review of the events that lead to discovery of the VAN ALLEN radiation belts and a summary of the information given in *Nature*, Feb. 14, 1959 in the preliminary report of JAMES A. VAN ALLEN and LOUIS A. FRANK (*see* 11.12–287, Dec. 1960, *Met. Abs.*). *Subject Heading:* **1. Van Allen belts.**—*E.Z.S.* Ⓢ

12.6–203 551.507.362.1:551.521.64

Solar origin of the outer zone of trapped radiation. *Current Science*, Bangalore, 28(11): 434, Nov. 1959. **DWB, DLC**—Experiments with three space rockets, namely: Pioneer III, the first Russian cosmic rocket and Pioneer IV, which were launched on different dates within three months, have provided confirmatory evidence for the solar origin of the outer zone of trapped radiation surrounding the earth. This paper compares the three sets of observations and indicates large temporal differences between Pioneer IV and Pioneer III and the Russian cosmic rocket. It is very significant that the launching of Pioneer IV was preceded by days of geophysical disturbances, whereas Pioneer III and the Russian cosmic rocket were launched during quiet geophysical periods. Pioneer IV has thus provided direct evidence for the solar origin of the outer radiation zone. *Subject Headings:* **1. Rocket radiation data 2. Van Allen belts.**—*I.S.* Ⓢ

12.6–204 551.521.64:551.586:616

*†Dye, D. L. (*Nuclear Physics Unit, Boeing Airplane Co., Seattle, Wash.*), and Noyes, J. C. (*Geo-Astrophysics Lab., Boeing Airplane Co., Seattle, Wash.*), **Biological shielding for radiation belt particles.** *Journal of the Astronautical Sciences*, N. Y., 7(3):64–70, Fall 1960. 5 figs., 2 tables, 15 refs., 13 eqs. **DWB**—Calculations are made, for the particle spectra in the most intense regions of the radiation belts, of the attenuation of the particle flux by shielding on a space vehicle, and of the biological dose rate due to the flux which has penetrated the shielding. Both protons and electrons are considered in the inner belt, but only electrons in the outer belt. Secondary particles and bremsstrahlung produced by these particles on interacting with a shield are also considered. It is shown that, despite the much higher electron fluxes, the protons are of much greater biological significance. *Subject Headings:* **1. Radiation belt shielding 2. Space vehicle radiation shields 3. Biological shielding from radiation.**—*Authors' abstract.* Ⓢ

12.6–205 551.521.64:550.385

Parker, E. N. (*Lockheed Aircraft Corp. Palo Alto, Calif.*), **Geomagnetic fluctuations and the form of the outer zone of the Van Allen radiation belt.** *Journal of Geophysical Research*, Wash., D. C., 65(10):3117–3130, Oct. 1960. 3 figs., 12 refs., 94 eqs. **DLC**—It is demonstrated by formal calculation that the large-scale geomagnetic fluctuations observed at ground stations result in a rapid and somewhat remarkable kind of diffusion of the electrons in the outer zone of the Van Allen radiation belt. An initial thin ring of electrons will give an immediate finite particle flux at infinity, at the same time that the group of the particles remaining moves radially inward as a 'wave.' We predict a decline of particle counting rate beyond about 4 earth radii of the order of $1/r^{\beta}$, where $\beta \cong 12$ to 16, depending upon the kind of counter, in agreement with the many observations. *Subject Headings:* **1. Van Allen belts 2. Geomagnetic fluctuations.**—*Author's abstract.* Ⓢ

12.6–206 551.521.64:550.385

Malville, J. M. (*Univ. of Colorado*), **The effect of the initial phase of a magnetic storm upon the outer Van Allen belt.** *Journal of Geophysical Research*, Wash., D. C., 65(9):3009–3010.

Sept. 1960. 2 figs., 12 refs., 4 eqs. DLC—The results of calculations of the longitudin invariant of the motion of a charged particle trapped in a magnetic dipole field and in a co pressed dipole field are presented. Using the invariant, the gap in the outer Van Allen electr belt at 1.9×10^4 may be accounted for by the Capetown magnetic anomaly. A result of i tegration for the latitudes 80° to 50° and a mirror height of 1000 km, as illustrated, shows th no latitude shift of the trapped radiation greater than 2° can be expected. A latitude shift 10 to 15° would be an explanation for the diurnal variation of the latitude of auroral hydrog emission and for the spiraling zones of auroral, ionospheric and magnetic activity in the polar ca A shift of the trapped radiation toward lower latitudes on the night side would produce maximum dumping of the trapped particles near the geomagnetic midnight as shown b other diagrams. Even a latitude shift of 10° to 15° would have negligible effect on lowerin the magnetic intensity at mirror height into auroral elevations, although the field could b distended through the current of trapped particles or through the creation of a geomagneti tail. The observed diurnal latitude shifts of various geophysical phenomena cannot y be associated with a shift of the trapped radiation belt. *Subject Headings:* **1. Van Alle belts 2. Magnetic effects on cosmic rays.**—*O.T.* Ⓢ

12.6–207 551.521.6

Hess, Wilmot N. (*Radiation Lab., U. Calif., Livermore*), **The radiation belt produced b neutrons leaking out of the atmosphere of the earth.** *Journal of Geophysical Research*, Wash D. C., 65(10):3107–3115, Oct. 1960. 4 figs., 26 eqs. DLC—The experimental informatio about the radiation belt is summarized. Calculations of the radiation belt spectra and fluxe based on the neutron decay source explains the observed features of the radiation belt an where other sources may be needed. The conclusion reached is that the inner zone of th radiation belt is quite likely supplied by neutron decay alone and also the E2 region of the oute zone may well be due to neutrons alone but that there may be so well as the neutron sourc another source of particles that supplies electrons of less than 100 kev to the E2 region of th outer zone. *Subject Headings:* **1. Van Allen belts 2. Cosmic ray neutrons.**—*Author's ab stract.* Ⓢ

12.6–208 551.521.64:551.510.53:662.2:539.1

Kellogg, P. J.; Ney, E. P. and Winckler, J. R. (*all, Univ. Minn.*), **Geophysical effects associated with high-altitude explosions.** *Nature*, London, 183(4658):358–361, Feb. 7, 1959 2 figs., 3 refs. DLC—The release of trapped Van Allen particles by the high altitude explosions from Johnston Island, and at Woomera in Australia not only caused auroras in the vicinity and at conjugate points in the opposite hemisphere, magnetic disturbances over the Earth's surface, propagation of Alfvén waves, artificial whistlers, and ionospheric radio effects, but also released radiation into varying altitudes above the Earth. These geophysical effects are discussed in detail. The nuclear explosion at Johnston Island was observed at the Magnetic Observatory at Apia. *Subject Headings:* **1. Van Allen belts 2. Nuclear explosion effects 3. Upper atmosphere phenomena 4. Johnston Island.**—*N.N.* Ⓢ

12.6–209 551.521.67:551.510.53

†Shklovskiĭ, I. S.; Krasovskiĭ, V. I. and Gal'perin, Iu. I., **O prirode korpuskuliarnoĭ radiatsii v verkhneĭ atmosfere.** [Nature of corpuscular radiation in the upper atmosphere.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 12:1799–1806, Dec. 1959. table, 23 refs. Russian summary p. 1799. **DWB, DLC.** Transl. into English in the corresponding number of its *Bulletin of the Academy of Sciences, USSR, Geophysics Series.* DLC—Analysis of the spatial distribution of the zones of the "earth's corona" leads to certain conclusions regarding the mechanisms of generation and "leakage" of hard corpuscles. It is shown that the concentration of particles in the solar corpuscular stream is adequate for renewing the corpuscles of the outer belt over a period of several hours. The energy spectrum of protons and the rate of generation of hard corpuscles in the interior belt is computed on the basis of a mechanism of disintegration of neutrons formed in stars, taking into account their deceleration during their diffusion in the atmosphere. It is demonstrated that the recording of hard charged particle-products of nuclear explosions distorts perceptibly for some time measurements of the intensity of corpuscular radiation in the "earth's corona," particularly in regions of large

energy. *Subject Headings:* **1. Corpuscular radiation 2. Upper atmosphere radiation data 3. Gaseous tail of Earth's atmosphere.**—*Transl. of author's abstract (I.L.D.)* Ⓢ

12.6–210 551.521.64:551.594.12:551.510.535

Mawdsley, J. and Ward, W. H. (*both, Dominion Physical Lab., New Zealand*), **Field-aligned ionization.** *Journal of Geophysical Research*, Wash., D. C., 65(6):1828–1830, June **1960.** 16 refs. **DLC**—It seems that field-aligned ionization in both E and F regions may result from leakage of particles from the radiation belts. This is distinctly more likely than that anisotropic turbulence is the causative mechanism of the nighttime echoes in middle latitudes. *Subject Headings:* **1. Ionospheric ionization 2. Cosmic ray ionization 3. Van Allen belts.**—*E.Z.S.* Ⓢ

E. SOLID EARTH GEOPHYSICS

E1. GRAVITY

12.6–211 551.506.22 526.7

Woollard, George P., **Gravity observations during the IGY.** *American Geophysical Union, Geophysical Monographs*, No. 2:198–202, **1958. DLC**—In this review of the IGY gravity program, the author discusses the difficulties of measuring gravity changes by spring balances, the use of a gravimeter for absolute gravity determinations involving such instruments as the Invar compound pendulum of Cambridge University, the quartz compound pendulum of the Gulf Research Development Company of the U. S., the world network of gravity bases, the marine gravity program using the new Graf marine gravimeter, etc., observations with gravimeter made on an ice floe off Greenland and on Ice Island T-3 in the Arctic and in Antarctica during various traverses and studies on the response of the earth's crust to the tidal attraction of the sun and moon. *Subject Headings:* **1. IGY gravity program 2. Gravity measurement instruments.**—*I.L.D.*

12.6–212 551.506.22:526.73

Woollard, George P. (*Dept. of Geology, Univ. of Wisconsin*), **Pendulum and gravimeter measurements of the earth's gravity.** *American Geophysical Union, Transactions*, 39(6):1205–1211, Dec. **1958.** 4 figs., 3 tables. **DWB, DLC**—Information on the physical characteristics of the earth has been gained during the IGY by instruments that measure the differences in gravity from place to place. These instruments, the pendulum and gravimeter, are discussed here and the results obtained by using each of these instruments are included. Results from 16 stations in the U. S. are compared. Measurements made at 11 Antarctic gravity bases are reported on. *Subject Headings:* **1. Gravimeter measurements 2. Pendulum measurements 3. IGY gravity program 4. United States 5. Antarctica.**—*N.N.*

E2. TECTONICS

See: **Geophysical discussion on continental drift,** 12.6–70.

F. OCEANOGRAPHY—HYDROLOGY—GLACIOLOGY

F1. OCEANOGRAPHY

See: **Pacific Sci. Conf. Proceedings-Oceanog.,** 12.6–2; **Sounding the deep** (Diomidov, Dmitriev), 12.6–39; **Under the oceans** (Gaskell), 12.6–40; **Bottom explorations** (Larionova), 12.6–41; **Scattering of saline drops near the seashore** (Kita, Aya), 12.6–363.

F2. HYDROLOGY

See: **Sec. on Hydrometeorology,** p. 1196; **Channel process** (Kondrat'ev et al.), 12.6–16.

F3. LIMNOLOGY

General—History—Instruments

12.6–213 551.468.4:551.463/4(262

*†Caspers, Hubert (*Zoologisches Staatsinstitut, Hamburg, Germany*), **Black Sea and Sea Azov.** *Geological Society of America, Memoir*, No. 67:801–889, Dec. **1957.** 37 figs., 25 tab eqs., bibliog. p. 872–889. "Transl. by Karl P. Schmidt from the German." **DLC** (QH542.N —Physical geography of the Black Sea, geological and faunistic history, hydrography of t Black Sea (vertical structure of water mass, temp., density and salinity variations, surfa currents), hydrochemical conditions (N, P, O, H_2S, CO_2), organic cycle, bottom deposi plankton, vertical distribution, and biomass of plankton; the benthos (zoobenthos), stra zone reefs, lagoons, relict fauna, fisheries and productivity, etc., are treated in great det with numerous graphs, charts and tables. Numerous references to Russian sources a included in the extensive and well documented bibliography. *Subject Headings:* **1. H drography of seas 2. Chemistry of sea water 3. Plankton 4. Black Sea 5. Sea of Azo I. Schmidt, Karl P.**—*M.R.*

12.6–214 551.583.3:551.311.2:551.481.1(474

Garunkshtis, A. A., **Zamechaniia po vosstanovleniiu paleogidrologicheskogo rezhi nekotorykh ozer Litovskoĭ SSR.** [Note on the reconstruction of the paleohydrological regi of certain lakes in Lithuania.] *Vsesoiuznyĭ Gidrologicheskiĭ S"ezd, Trudy [of 3rd Conferen* Oct. 1957], Vol. 4, issued **1959.** p. 34–42. 5 figs. **DWB** (M79 V985tr), **DLC** (GB651.V83) There are 4000 lakes larger than 0.5 hectares and of an average depth of 15 m in Lithuani An analysis of their characteristics discloses their paleohydrological regime. After th formation, the water level dropped to a minimum (5–6 m lower than present) in the Bore (Ancilus) period. In the beginning of the Atlantic Period, the water level rose 2 to 6 m abo the present. In the beginning of sub-Boreal period, the water level dropped 3 to 4 m below t present. In the beginning of the sub-Atlantic period the stage rose 1.5 m above the presen All the variations are due to climatic changes. The earth's crustal deformation has only small influence. At present the water level is slowly dropping, due to deepening of the riv valleys. *Subject Headings:* **1. Lake hydrology 2. Paleolimnology 3. Climatic chang 4. Lithuanian S.S.R.**—*J. Němec.*

12.6–215 551.481.1:551.583

†Heusser, Calvin J. (*Amer. Geog. Society*), **Late-Pleistocene environments of the Laguna c San Rafael area, Chile.** *Geographical Review*, N. Y., 50(4):555–577, Oct. **1960.** 9 figs 61 refs. **DWB, DLC**—This is a report and interpretation of the palynological and other da obtained by the American Geographical Society Southern Chile Expedition, 1959. Th problem investigated concerned late-Pleistocene environmental changes at the Laguna. Th techniques of glacial geology, palynology, limnology and vegetational studies were employe The data thus obtained are systematically presented and illustrated by photographs, ma and diagrams. Some possible interpretations of these data are given Although some of th data suggest it, it is considered premature to conclude that in-phase hemispheric environmenta relationships existed during the late-Pleistocene. *Subject Headings:* **1. Lake Pleistocen environments 2. Pleistocene climatic changes 3. Laguna de San Rafael Area, Chile.**—*I.S*

Chemical, Physical and Biological Characteristics

12.6–216 551.481.1:546.21(474.5) 551.526.

*Klimakaité, I., **Kai kurie duomenys apie Lietuvos TSR ežeru vandens dijini režima** [Some data about the gas conditions in lake water of Lithuania.] *Lietuvos TSR Moksl Akademija. Geologijos ir Geografijos Institutas, Moksliniai Pranešimai*, 8:107–119, **1958** 5 figs., 2 tables, 7 refs. Russian and English summaries p. 116–119.—Data on O_2, CO_2 an pH content of lake water obtained in summer and fall 1954–56 in the highlands of Lithuania are analyzed and presented in graphs and tables along with temperature data to 10 to 50 m depth. Surface waters are warm; bottom waters uniformly cold (4°–7°C). Oxygen conten depends on temperature, but decreases to values as low as 0.15 mg/l near the bottom of Du

bingiai Lake. Deficiency at the bottom is due to intense oxidation of vegetation and organic matter at the bottom. Diurnal variations noted in summer near the shore are due to photosynthesis (max. 3 p.m.; min. 3 a.m.). CO_2 varies inversely with O_2, it being zero in surface layers to 5–9 m depth; pH varies inversely with CO_2 concentration. In autumn temperatures, CO_2, O_2 and pH are fairly uniform at all depths. *Subject Headings:* **1. Limnology 2. Gases in lake water 3. Lake temperatures 4. Lithuanian S.S.R.**—*M.R.*

12.6–217 551.468.4:551.463/4(262.5)

*†Pakhomova, A. S., **K voprosu o khimicheskoĭ prirode i dinamike vzveshennykh veshchestv i donnykh otlozheniĭ Azovskogo moria.** [Chemical nature and dynamics of suspended matter and bottom sediments in the Sea of Azov.] *Moscow. Gosudarstvennyĭ Okeanograficheskiĭ Institut, Trudy*, No. 52:74–103, **1960.** 8 figs., 9 tables, 30 refs. Russian summary p. 102–103. **DWB**—The results of investigations on the chemical composition of suspensions, bottom deposits and bottom solutions obtained during various expeditions on the Sea of Azov are analyzed in order to explain the chemical nature and the dynamics of the various substances and their variation with the control of stream flow since the construction of the Tsimlyansk Reservoir in 1958. Extensive data are presented on the mechanical composition of suspended matter and chemical composition, and of bottom deposits and bottom solutions including the chlorine content, alkalinity and biogenic elements. The absolute amount of biogenic elements in suspended matter and bottom deposits of the Sea of Azov, according to data of 1958, declined in comparison with the data for 1950–1952. The richest biogenic elements and organic matter of the suspension of the Gulf of Taganrog are the products of phytoplankton and the silt from the Don River. Sea suspensions contain larger amounts of organic matter (C, N) than suspensions of the Don River owing to the formation of organic matter in the sea itself by phytoplankton. Precipitates of the Sea of Azov are more silty and contain more biogenic elements than precipitates of the Gulf of Taganrog. After regulation of the flow of the Don River, organic matter showed an enrichment in its nitrogen and phosphorus content and a decrease in the proportion of carbon dioxide to nitrogen. The river detritus became qualitatively younger and closer to the organic sea suspension; it contained less organic matter of vegetable origin having a higher proportion of CO_2 to N_2 than before control. Investigation of bottom solutions showed a larger concentration of biogenic elements than in water not near the bottom. This is explained by the mineralization of organic matter in bottom deposits and by the arrival of newly formed biogenic combinations in solution. The absolute alkalinity of bottom solutions increases with disintegration of organic matter in the precipitates. The maximum alkalinity is observed in the bottom solutions of silty precipitates of the Sea of Azov. The alkalinity-chlorinity coefficient, as an index of the spread of fresh waters, is higher in the Taganrog Inlet than in the Sea of Azov. Precipitates of the Sea of Azov represent predominantly fine dark silt which are greenish gray or gray. Shell layers are observed frequently along the vertical. Perceptible variations in the mechanical composition of deposits in connection with controlled flow of the Don River were not observed. *Subject Headings:* **1. Suspended matter in sea water 2. Sea bottom deposits 3. Chemical composition of sea water 4. Organic matter in sea water 5. Sea of Azov 6. Gulf of Taganrog.**—*Author's abstract and I.L.D.*

12.6–218 551.468.4:551.464(262.5)

*Shul'gina, E. F., **Raspredelenie velichin shchelochnosti kak pokazatelia vzaimodeĭstviia rechnykh i morskikh vod v Azovskom more.** [Distribution of alkalinity as an index of the interrelationship between river and sea waters in the Sea of Azov.] *Moscow. Gosudarstvennyĭ Okeanograficheskiĭ Institut, Trudy*, No. 52:49–73, **1960.** 10 figs., 10 tables, 18 refs. Russian summary p. 73. **DWB**—In order to explain the extension of currents of runoff of the Don and Kuban Rivers in the Sea of Azov and the effect of this extension upon the ionic composition of the water of the Sea, extensive observations were carried out on the distribution of alkalinity and the alkaline-chlorine coefficients on the surface of the Sea of Azov. On the basis of hydrochemical and hydrological characteristics which depend primarily upon wind, the Sea of Azov is divided into the following areas, viz: the central part of the Sea, the Kerch Strait, the Gulf of Taganrog, the Kuban region and the Sivash region. The positions of stations in the various areas are shown on maps and the methods of observation are described. Data on the dis-

tribution and variation of absolute alkalinity and alkalinity-chlorinity coefficients on spec
days, variation of absolute alkalinity and alkaline-chlorine coefficients, and the dependenc
alkalinity-chlorinity coefficients upon chlorine content are presented in tables and grap
The distribution of absolute (Alk mg equiv/l) and relative ($Alk/Cl \cdot 10^4$) values of alkalin
serves as an index of interactions which differ according to the nature of the carbonate-calci
waters of river runoff and the chloride-sodium waters of the Black Sea flowing into the
of Azov. On the basis of the indices on the surface and at different depths, there was
tablished the presence of an anomalous increase of alkalinity in the Gulf of Taganrog from
mouth of the Don River to the outflow from the Gulf. *Subject Headings:* **1. Alkalinity of s
water 2. River water influences on sea water 3. Don River 4. Sea of Azov.**—*I.L.D.*

12.6–219 551.468.4:551.463/4(262

*†Tsurikova, A. P., **O zavisimosti mezhdu solenost'iu, khlornost'iu i plotnost'iu vod Az
skogo moria.** [Relationships between salinity, chlorinity and density of waters of the Sea
Azov.] *Moscow. Gosudarstvennyĭ Okeanograficheskiĭ Institut, Trudy*, No. 52:27–48, 19
4 figs., 12 tables, chart, 25 refs., 15 eqs. Russian summary p. 47. **DWB**—A detailed revi
is presented of Soviet studies on the chlorine content, salinity, density and specific gravity of t
waters of the Sea of Azov, the Gulf of Taganrog, etc. This is followed by a description of t
methods for collecting and preserving water samples, determination of chlorine and brom
content and total salinity and the procedures for determining density by means of a pyknome
and a thermostat (both of which are illustrated by diagrams). On the basis of the resu
obtained, the author developed formulas: 1) for the relationship of salinity and chlorine conte
of waters of the Sea of Azov for the chlorine content above and below 4%, namely:

$$S = 0.023 + 1.792\ Cl \quad \text{and} \quad S = 0.263 + 1.661\ Cl + 0.0294\ Cl^2,$$

respectively; 2) for the relationship between chlorine content (Cl %) and relative densi
(σ_0), namely:

$$\sigma_0 = 0.037 + 1.435\ Cl$$

for the open portion of the Sea of Azov and

$$\sigma_0 = 0.243 + 1.2009\ Cl + 0.0671\ Cl^2$$

for the highly freshened waters of the Gulf of Taganrog and the Kuban region. Also, equatio
for expressing the relationship between density at different depths and temperature and speci
gravity are presented. Extensive data are given in tables. *Subject Headings:* **1. Salinity of s
water 2. Chlorinity of sea water 3. Density of sea water 4. Sea of Azov 5. Gulf of T
ganrog.**—*I.L.D.*

12.6–220 551.556.8:551.326.8

Dobrovol'skaia, V. K. and Pekhovich, A. I., **Eksperimental'noe issledovanie vliianii
vetrovogo volneniia na ledoobrazovanie v vodokhranilishchakh.** [Experimental research o
the influence of wind waves on the formation of ice in reservoirs.] *Meteorologiia i Gidrologii*
Moscow, No. 10:33–36, Oct. **1960.** 3 figs. **DWB, DLC**—When the period of ice formatio
coincides with windy weather the formation of a firm ice cover is preceded by the formatio
of sludge. This is important in determining the total weight and the thermal characteristic
of the ice cover of the following winter. This paper describes laboratory experiments in whic
the authors have been successful in simulating the natural conditions of such ice formation
Subject Headings: **1. Wind waves 2. Ice formation on reservoirs.**—*R.B.*

12.6–221 551.509.3:551.556.8:551.481.1(584.8

Gynkina, M. M. and Masarskiĭ, S. I., **Mikroseĭsmy ozera Issyk-Kul'.** [Microseisms o
Lake Issyk Kul.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 6:884–890. **1959**
7 figs., table, 2 refs. **DLC.** Transl. into English in the corresponding number of its *Bulleti
of the Academy of Sciences USSR, Geophysics Series.* **DLC**—The short period microseismi
movements in Kirghiz and the southern districts of eastern Kazakhstan are produced by th
waves on the surface of Lake Issyk Kul which result from the storm winds prevailing durin
the passage of cold fronts. The intensity of the microseisms depends not only upon the win

force but also upon their direction. The most intense microseisms occur when westerly winds and easterly winds flow simultaneously on the western and eastern shore of the lake, respectively. The amplitude of the microseisms subsides quickly with distance from the lake and at about 800 km the short period microseisms are not recorded. The direction of the plane of polarization of the movement of the ground in short period microseisms depends upon ground conditions. Graphs showing the frequency of microseismic storms, the variation of pressure and wind and simultaneous short period microseisms, etc.; a table giving comparative characteristics of short period microseism storms at different stations and synoptic maps describing weather associated with microseismic storms are presented. *Subject Headings:* **1. Microseisms 2. Storm wind effects on lakes 3. Lake Issyk Kul, Kirghiz S.S.R.**—*I.L.D.*

12.6–222 551.556.8:551.48.018.3(47)

Kokoulin, P. P., **Metodika izmereniia elementov vetrovykh voln na Tsimlianskom vodokhranilishche.** [Method of measuring the elements of wind waves in the Tsimlyansk reservoir.] *Vsesoiuznyĭ Gidrologicheskiĭ S"ezd, Trudy [of 3rd Conference, Oct.* 1957], Vol. 4, issued **1959.** p. 117–124. 6 eqs. **DWB** (M79 V985tr), **DLC** (GB651.V83)—Descriptions of floating and electrical (EKV) wave buoys, wave measuring buoys recording maximum and minimum (MMV) and an automatic wave-recording instrument (wavemeter VEV-K) are presented. All the instruments are used on the Tsimlyansk reservoir. Figures illustrate the description. *Subject Headings:* **1. Wind wave measurement techniques 2. Wave measuring apparatus 3. Wind waves on reservoirs 4. Tsimlyansk reservoir, Rostov Region, U.S.S.R.**—*J.N.*

12.6–223 551.556.1:551.511.3:551.481.1 551.556.8:551.481.1

Labzovskiĭ, N. A., **O dinamicheskikh iavleniiakh v vodokhranilishchakh.** [Dynamic phenomena in water reservoirs.] *Vsesoiuznyĭ Gidrologicheskiĭ S"ezd, Trudy [of 3rd Conference, Oct.* 1957], Vol. 4, issued **1959.** p. 50–56. 3 figs., 2 refs., 3 eqs. **DWB** (M79 V985tr), **DLC** (GB651.V83)—Wave and tide phenomena caused by wind in reservoirs are discussed in connection with the erosion of the shore. Formula for slope of water at every point of the reservoir is given. The erosion of the shores is evaluated on the basis of frequency and mass curves of maximum heights and active depth of waves. A frequency distribution curve of eroded volumes of earth is constructed and from it a probability curve of shifting of the shoreline can be drawn. *Subject Headings:* **1. Wind waves on reservoirs 2. Tidal effects on reservoirs 3. Shore erosion in reservoirs.**—*J. Němec.*

12.6–224 551.3.053:627.1

Kolbutov, A. D., **Geomorfologicheskiĭ analiz pererabotki beregov vodokhranilishch.** [Geomorphological analysis of the changes in the shorelines of water reservoirs.] *Vsesoiuznyĭ Gidrologicheskiĭ S"ezd, Trudy [of 3rd Conference, Oct.* 1957], Vol. 4, issued **1959.** p. 56–59. **DWB** (M79 V985tr), **DLC** (GB651.V83)—Shores of reservoirs are classified in five groups according to their geomorphological characteristics. There are four types of eroded shores and one sediment accumulating shore type. *Subject Headings:* **1. Geomorphology of reservoir shores 2. Shore erosion in reservoirs 3. Depositional shores in reservoirs.**—*J. Němec.*

12.6–225 525.623:627.1(47)

Karaushev, A. V., **Issledovanie i raschet sgonno-nagonnykh iavleniĭ na vodokhranilishchakh.** [Investigation and calculation of tidal phenomena in water reservoirs.] *Vsesoiuznyĭ Gidrologicheskiĭ S"ezd, Trudy [of 3rd Conference], Oct.* 1957, Vol. 4, issued **1959.** p. 103–110. 2 figs., 24 eqs. **DWB** (M79 985tr), **DLC** (GB651.V83)—The theoretical aspects of tide phenomenon caused by wind on the Tsimlyansk reservoir are examined. From the formula for turbulent flow of liquids, a computing method is derived, for forecasting tide phenomena. *Subject Headings:* **1. Tides in reservoirs 2. Tide forecasting 3. Tsimlyansk reservoir, Rostov Region, U.S.S.R.**—*J. Němec.*

12.6–226 551.526.8(432.1)

*†Kühlmann, D. H. H., **Die Temperaturverhältnisse in zwei Kleingewässern verschiedener landschaftlicher Exposition.** [Temperature conditions in two ponds with different sur-

roundings.] *Acta Hydrophysica*, Berlin, 6(4):191–267, **1960.** 39 figs., 7 tables, 54 re
DWB, DLC—The temperatures in two ponds near Leipzig, one in a forest, the other in
meadow, were investigated. Bottom, surroundings and climatological parameters proved to
important factors. The diurnal temperature range decreased from the shore towards t
center and downwards. The temperature variations in the forest pond appear to be mo
damped than in the meadow pond. The time lag between solar radiation and maximum ten
peratures increases from spring to autumn. Convection due to density gradients is observe
when a change in the radiation balance occurs. Turbulence is due to wind stress. Metho
to determine the daily mean temperature are described. *Subject Headings:* **1. Pond tempera
tures 2. Environmental influences on pond temperatures 3. Leipzig, Germany.**—*E. R. R.*

Meteorological Elements

12.6–227 551.521.14:551.524:551.526.8:627.8

Timofeev, M. P., **O raschete sostavliaiushchikh teplovogo balansa ogranichennyk
vodoemov.** [Calculation of the components of the radiation balance of bounded wate
reservoirs.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, 59(121):3–8, 195
5 refs., 26 eqs. **DWB, DLC**—The application of the equation of heat balance for computin
the components of heat balance in bounded reservoirs whose dimensions do not exceed 100 k
and whose depth ranges between 10 and 20 m, is illustrated. The heat balance equation for
surface is given by $R'=LE'+P'+B'$, where R' = incoming and outgoing radiation, LE' = los
of heat by evaporation (condensation), P' = heat exchange between water surface and air
B' = heat exchange between water surface and lower layers. It is shown that

$$R'=R_d'+S(A'-A)-4T^3\sigma(T_s-T')+4\sigma T^3(T'-T_s')$$

where R_d' = radiational balance for a land surface, T_s'; T_s = temperature of surface of land
and of water, respectively, T' = air temperature, A' = albedo of dry land and A = albedo o
water. In the case of the other terms of the heat equation—

$$E'=\frac{0.15u_2}{x^{0.1}}\,[D+\alpha(T')(T_s-T')]\ \text{mm/day}$$

where D = moisture deficit of the atmosphere, x = mean dimension of the reservoir in the
direction of wind velocity, u_2 = wind velocity at 2 m, $P'=bu_2(T_s-T')$ cal/cm² day, where

$$b=\frac{4.8}{x^{0.1}} \quad \text{and} \quad B'=B_g'+C\int_0^H \frac{\partial\theta}{\partial t}\,dz+C\int_0^H W\frac{\partial\theta}{\partial x}\,dz$$

where C = total heat capacity of water, θ = temperature of water, W = velocity of flow (co-
ordinate x directed along the flow), B_g = heat exchange in the bed of the reservoir. The tem-
perature of the surface of the water is given by

$$T_s-T'=e^{-mt}\left[(T_s-T')_0+\frac{\bar{n}}{m}(e^{mt}-1)\right]$$

where

$$m=\frac{4\sigma T^3+Lau_2\alpha(T')+bu_2}{C\alpha}$$

and

$$n=\frac{R'_d+S(A'-A)-Lau_2D-B_g'-Cx(dT'/dt)+4\sigma T^3(T'-T_s')}{C\alpha}$$

and

$$R'=R_d+S(A'-A)-4\sigma T^3e^{-mt}\left[(T_s-T')_0+\frac{\bar{n}}{m}(e^{mt}-1)\right].$$

Simplification of this procedure is illustrated for shallow artificial reservoirs during summer,
when the vertical temperature is isothermal, and is presented with the aid of the relevant

formulas. *Subject Headings:* **1. Radiation balance over water surfaces 2. Heat balance of water surfaces 3. Reservoirs.**—*I.L.D.*

12.6–228 551.526.8:551.481.1(479.25)

Aĭnbund, M. M., **Nekotorye voprosy termiki oz. Sevan.** [Certain problems of the thermal conditions of Lake Sevan.] *Vsesoiuznyĭ Gidrologicheskiĭ S"ezd, Trudy [of 3rd Conference, Oct.* 1957], Vol. 4, issued **1959.** p. 244–251. 4 figs., 2 refs. **DWB** (M179 V985tr), **DLC** (GB651.V83)—The thermal regime of Lake Sevan in Armenia has been studied for five years. A remote control electric thermometer (DWT-N) has been widely used for the purpose. Variations of the thermal regime in connection with the lowering of the water level, differences between the Greater and Smaller Sevan Lakes and the formation of a "cold spot" in Greater Sevan Lake are described. *Subject Headings:* **1. Lake temperatures 2. Thermal regime of lakes 3. Lake Sevan, Armenian S.S.R.**—*J. Němec.*

12.6–229 551.511:551.551.8:551.524:551.526.8(285:47)

Konstantinov, A. R. and Fedorova, T. G., **Rezultaty issledovaniia raspredeleniia meteorologicheskikh elementov nad vodnoĭ poverkhnost'iu i teplovogo rezhima vodnykh mass Valdaĭskogo ozera.** [Results of investigations on the distribution of meteorological elements above a water surface and the thermal regime of Lake Valdai.] *Vsesoiuznyĭ Gidrologicheskiĭ S"ezd, Trudy [of 3rd Conference, Oct.* 1957], Vol. 4, issued **1959.** p. 237–244. 3 figs., 2 refs. **DWB** (M79 V985tr), **DLC** (GB651.V83)—The Valdai experimental laboratory of the State Hydrological Institute has studied for 6 years on Lake Valdai (20 sq km of surface, 15–20 m average depth) the following elements: stratification of atmosphere above the lake, the influence of the roughness coefficient of the water surface on the wind velocity, evaporation and turbulent heat exchange between the water and atmosphere (on gradient basis). Description of instruments and methods is given. Stratification of water layers has also been examined. Other elements, such as air humidity, air temperature, etc., are briefly discussed. *Subject Headings:* **1. Turbulent heat exchange 2. Roughness effects on wind speed 3. Lake stratification 4. Thermal regime of lakes 5. Lake Valdai, Valdai Hills, U.S.S.R.**—*J. Němec.*

12.6–230 551.526.8:551.481.1(476)

*†Konstantinov, A. R. and Fedorova, T. G., **Termicheskiĭ rezhim Valdaĭskogo ozera i raspredelenie meteoelementov nad ego poverkhnost'iu.** [Thermal regime of Lake Valdai and the distribution of meteorological elements above its surface.] *Leningrad. Gosudarstvennyĭ Gidrologicheskiĭ Institut, Trudy,* No. 76:112–151, **1960.** 19 figs., 12 tables, 39 refs. Russian summary p. 149. **DWB**—The authors present a comprehensive analysis of experimental data on the distribution of meteorological elements over a water surface, the formation of the thermal regime and the heat balance of a lake on the basis of studies of the relationship between evaporation and the elements determining it and the transformation of atmospheric flow at varying distances from the shore. The investigation was carried out on Valdai Lake during 1952–1958. The contents of this paper include the following: a description of the observational procedure; an analysis of the profiles of the meteorological elements on the water surface of Valdai Lake with the aid of the Ri number for determining atmospheric stratification; calculation of the roughness parameter; empirical equations relating profiles of atmospheric temp. and humidity to characteristics of the underlying surface etc; the thermal regime of the lake as reflected in the thermal stratification of the water mass; the characteristics of the components of the heat balance of Lake Valdai as determined with the aid of the Ångström equation for effective radiation, and equation for heat accumulation in a water mass, namely $Q=(\Delta T_1, a_1, +\Delta T_2 a_2+\cdots+\Delta T_i a_i)Lc\delta$, where ΔT_1 = temp. increase at a given depth, $a_i = l_i/L$ = coefficient for which l_i = thickness of water depth with increase in ΔT_1, L = depth of the lake at a given point, c = heat capacity of water, δ = density of water, equation of turbulent exchange of the water surface with the atmosphere and an examination of the results of experimental studies of the transformation of atmospheric currents over the lake. Data on the mean values of the meteorological elements over the lake, profiles of the meteorological elements, etc. are presented in tables and graphs. *Subject Headings:* **1. Thermal regime of lakes 2. Heat balance of lakes 3. Meteorological elements above a lake 4. Lake Valdai, Valdai Hills, U.S.S.R.**—*I.L.D.*

12.6–231 551.326.85:551.48

*Medres, P. L., **Ledovyĭ rezhim Ladozhskogo ozera po materialam aviarazvedok.** [Ice regime of Lake Ladoga according to aerial surveys.] *Leningrad. Gosudarstvennyĭ Gidrologicheskiĭ Institut, Trudy*, No. 66:92–139, **1957.** 12+16 figs., 12 tables, charts, 8 refs. **DW**—The fundamental characteristics of the winter and ice regime of Lake Ladoga are investigated on the basis of airplane surveys made during 1944–1956 and data from stations along the shore and on the islands of the lake. The contents of this comprehensive study include the following: the routes of the aircraft, their flight altitudes and mapping of observations; physical geography and climatic data on the Lake Ladoga region; meteorological conditions during the aerial survey periods, including classification of the seasons by atmospheric temperature conditions; appearance of ice and freezing according to shore observations; freezing of the lake during warm, moderate and cold winters; relationship between general ice conditions and depth of ice crust and atmospheric temperature; freezing pattern of the lake; short range forecast of ice appearance in the southern part of the lake; ice thickness and the conditions of its growth as determined by shore and island stations; break up of ice in early and late springs; spring ice conditions as given by station observations; pattern of ice break up on Lake Ladoga; lake ice drift to the Neva River; and relationship between the degree of disappearance of ice from the lake and atmospheric temperature. In addition to extensive data in the form of tables and graphs in the text, an appendix containing diagramatic maps of ice conditions on Lake Ladoga for the period 1943–1956 is included. *Subject Headings:* **1. Ice regime of lakes 2. Lake ice 3. Lake Ladoga, U.S.S.R.**—*I.L.D.*

12.6–232 551.553:551.481.1

Selezneva, E. S., **O proiskhozhdenii letnikh severnykh vetrov v basseĭne oz. Sevan.** [Origin of north winds in summer in the Lake Sevan Basin.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 78:77–83, **1958.** fig., 3 refs. **DLC**—An explanation of the origin of northerly winds in the Sevan region is presented. During the summer the Araks and Kura valleys are intensely warmed; daily temperatures exceed 30°C, especially in the Araks valley which is in the territory of the Armenian S.S.R., and lies at an elevation of 800–900 m above sea level. At this height the air over Kura is considerably colder so that a large horizontal temperature gradient directed from Araks to Kura arises. This thermal effect in turn brings about a considerable pressure gradient in the free atmosphere also directed like the temperature gradient from Araks to Kura. A circulation arises above from Araks to Kura and below in the opposite direction. The formation of upper branches of the circulation leads to a flow of air from the more heated region (Araks) to the cooler one (Kura); this produces a reverse pressure gradient below and a corresponding flow of cold air. The high mountain barrier between the valleys weakens the exchange of air and prevents the equalization of pressure, intensifying thereby the pressure gradient in the lower atmosphere in the direction from Kura to Araks. These hypothetical conditions are verified by means of actual observations. It is shown that the circulation system between the Araks and Kura valleys extends up to 4–4.5 km and more general air currents appear only at a higher altitude. The lower branch—northerly winds—develop to a height of 2.5–3 km, i.e., approximately up to 0.5–1 km above the surface of Lake Sevan. Above, north-northeasterly winds should be replaced by oppositely directed winds. *Subject Headings:* **1. Wind variations 2. Kura Valley, Transcaucasia, U.S.S.R. 3. Araks Valley, Transcaucasia, U.S.S.R. 4. Lake Sevan, Armenian S.S.R.**—*I.L.D.*

12.6–233 551.526.8(479.25) 551.553.11:551.481.1(479.25)

*Vorontsov, P. A., **Nekotorye osobennosti termicheskogo i vetrovogo rezhimov nad oz. Sevan.** [Characteristics of the thermal and wind regime of Lake Sevan.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 78:41–64, **1958.** 17 figs., 8 tables, 2 refs. **DLC**—This study of the heat and wind regimes over Lake Sevan was carried out by the methods of vertical and horizontal airplane sounding. Air temperature was measured by means of a resistance thermometer and atmospheric humidity was determined from meteorograph records. With the aid of extensive data, presented on graphs and tables and on a map, the author discusses the wind regime, the heat regime aloft, the cloudiness, the moisture cycle and localities of intense winds in the Sevan region. The wind and thermal regimes of the northern part of Lake Sevan was, during summer, influenced considerably by the mountain valley circulation

of the Kura River Valley. During July 1956, the air temperature at 13 hours was at all stations 1.2–1.5°C below the normal and only at Shorzha was it 1°C higher. Northerly and northeasterly winds prevailed at the ground; easterly and southeasterly winds were somewhat less frequent than the normal. In the Shorzha region the wind, during July 1956, was northeasterly with a frequency greater than the normal; it produced a föhn flow which raised the air temperature by 1°C. The wind direction in the lower layers over different parts of the lake is characterized by four intense air flows during summer, namely: 1) relatively cold and humid currents of the northern quarter of the horizon flowing towards the Little Sevan through a comparatively low mountain pass; 2) a comparatively warm and dry current of föhn origin in the Shorzha region; 3) warm and dry easterly flow also of föhn origin in the Mazra-Basargechar district with relatively large wind velocities; and 4) a warm dry air flow from the south of föhn origin observed in the Martuni region; it was relatively rare in July 1956. *Subject Headings:* **1. Thermal regime of lakes 2. Wind regime of lakes 3. Lake Sevan, Armenian S.S.R.**—*I.L.D.*

12.6–234 551.558:551.481.1(479.25)

*Vorontsov, P. A., **Vertikal'nye dvizheniia vozdukha nad oz. Sevan.** [Vertical air movement over Lake Sevan.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 78:108–119, **1958.** 6 figs., 6 tables, 6 refs. **DLC**—Both qualitative and quantitative characteristics of ascending air motions over Lake Sevan, especially in the shore zone, were investigated in July 1956 by the Main Geophysical Observatory. In the lower atmospheric layers constant level pibals balloons with reduced velocity and also airplane soundings were employed. Data are presented on the orienting characteristics of the surrounding mountain ranges at the observation point of Lake Sevan. Mean velocities of descending currents-Δw, and positive values Δw, which are some relative characteristics of the intensity of the turbulence state of the atmosphere at different hours, mean velocities during ascent and angles of slope α for different layers, values of ascending currents including horizontal distance of the level pibal from the observation point, height of atmospheric layers, vertical pulsations of atmospheric currents and the distribution of values of airplane bumpiness. *Subject Headings:* **1. Vertical motion over lakes 2. Lake Sevan, Armenian S.S.R.**—*I.L.D.*

12.6–235 551.588.4:551.524:551.571(439.1)

Péczely, György, **A Balaton hatása a nedvesség és hőmérséklet alakulására.** [Influence of Lake Balaton on the development of humidity and temperature.] *Időjárás*, Budapest, 62(4):207–212, July/Aug. **1958.** 3 tables, 5 refs. Hungarian and English summaries p. 207. **DLC**—The influence of the lake on humidity and temperature of the coastal zone and remote environment is studied on the basis of processing 5 years of data from two coastal and two remote stations. It is shown that in case of atmospheric motion of adequate direction the water vapor coming from the direction of the lake and absorbed by the coastal zone, amounts to about 5% of the average water vapor content. The temperature-effect depends—in addition to the character of the atmospheric motion—on the temperature difference of the air and the water. Data of Veszprém and Iregszemcse—being situated farther from the coast—show that in a distance of about 20 km the water of the lake has no influence on the formation of humidity. *Subject Headings:* **1. Lake influences on temperature 2. Lake influences on humidity 3. Lake Balaton, Hungary.**—*Author's abstract.*

12.6–236 551.571.3:551.588.4

Staley, Raymond C. (*Univ. Wash.*), **Some observations of water vapor fluctuations in a stable atmosphere over a lake surface.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, Vienna, 11(4):458–464, **1960.** 6 figs., table, 4 refs., 8 eqs. English and French summaries p. 458. **DLC**—The Crain microwave refractometer and a bead thermistor have been used to measure 2 to 30-sec period fluctuations in water vapor in a stable atmosphere over a lake surface. It appears that such fluctuations can be related to air flow over water waves and that they permit an estimate of a mixing length for water vapor. *Subject Headings:* **1. Water vapor fluctuations over lakes 2. Humidity variations 3. Lake influences on water vapor.**—*Author's abstract.*

12.6–237 551.573:551.481.2

*Baker, Donald (*U. S. W. B.*) and Linsley, Ray K. (*Prof. Civil Eng., Stanford Univ.*), **Fel Lake evaporation study.** Stanford Univ. Dept. of Civil Engineering, Contract Cwb-901 Technical Report No. 5, April **1960.** 12 p. 7 figs., 3 tables, 4 refs. **DWB** (M(051) S785t)— The results of the Lake Hefner water-loss study were applied to Lake Mead and the Weathe Bureau wanted to test the mass transfer and pan methods used in the Lake Hefner study, on lake where the climatic regime was different than at Lake Hefner. The Lake Hefner projec tested energy budget, mass transfer and pan coefficient methods for estimating evaporatio from free-water surfaces. Felt Lake, near the campus, was selected as the site of the experi ment conducted in cooperation with Stanford University. The observational program at Fel Lake covered the period Jan. 1, 1954 through Dec. 15, 1955. The project results were generall satisfactory, but were not up to expectations. Seepage was a significant factor in the evalua tion of the water budget. The results obtained using the methods based on meteorologica factors directly observed Class A pan evaporation adjusted for heat transfer through sides Class A pan evaporation as a net radiation integrator, Class A lake-to-pan coefficient, and energy budget were very consistent. The results using the Lake Hefner mass transfer equations were quite disappointing. Evidently the dewpoint measurements at the barge were not in the vapor blanket of the lake. Therefore, it should not be expected that the Lake Hefner mass transfer equation for barge dew point and barge wind would be adequate for Felt Lake. The Lake Hefner mass transfer equation for upwind dew point and 4-meter barge wind was not expected to be applicable except for a lake the size of Lake Hefner. The collected data are shown in tables and graphs. A layout map of the Felt lake vicinity is included. *Subject Headings:* **1. Evaporation from free water surfaces 2. Energy budget 3. Evaporation from lakes and reservoirs 4. Free water evaporation 5. Water loss investigations 6. Felt Lake, Calif.**—*E.Z.S.*

12.6–238 551.573:628.13(794)

*†Blaney, Harry F. and Muckel, Dean C., **Evaporation from water surfaces in California.** *California. Dept. of Water Resources, Bulletin,* No. 73, Oct. **1959.** 81 p. 3 figs., plate, 15+6 tables, 49 refs. **DWB** (M73 C153eva). "Contains most of text of the original Bulletin No. 54, issued **1947** (*see* K-151, Nov. 1950, *Met. Abs.*). No. 54 A, **1948** and No. 54 B, **1955** consisted of tabular data, 1881–1946 and 1946–1954. Appendix B of No. 73 (to be published) will cover data from 1946, as No. 54B is out of print and no longer available. Future bulletins in the 73-series will include data collected in the interim between dates of publications, together with complete records of stations not previously published." **DWB**—The report was prepared as a basis for estimating evaporation from present and future reservoirs throughout California. The chapter on evaporation investigations includes relation of water temperature, air temperature and altitude to evaporation and the Salton Sea Investigation and investigations from five small water areas. It deals also with five different evaporation coefficients. It includes, finally, the evaporation from large water areas. An appendix to be published as quickly as data can be collected and checked, will include basic data for evaporation stations throughout California covering the period since 1946. The results of a recent study on evaporation in the San Francisco Bay and Sacramento-San Joaquin Delta regions are presented in an appendix. *Subject Heading:* **1. Evaporation from water surfaces 2. California.**—*O.T.*

12.6–239 551.481.1:551.573(52)

Ito, N. (*Tokyo District Met. Obs.*), **On the evaporation from a few lakes in Japan.** *Meteorological Society of Japan, Tokyo, Journal, Ser.* 2, 38(4):200–206, Aug. **1960.** 5 figs., 3 tables, 12 refs., 10 eqs. English summary p. 200; Japanese summary p. 206. **DWB, DLC**—There are only a few lakes in Japan, for which both observational data of weather and water surface temperature are available for a long period. The author estimated the evaporation from these lakes by the heat budget method, mainly using meteorological factors, water surface temperatures and, especially in Lake Kawaguchi, the vertical distribution of water temperature. The same estimation was carried by the evaporation formula based on the turbulence theory. As a result it has been found that the yearly amount and the yearly variation process can be estimated by both methods, and that the neglect of energy storage in the water in the heat

budget has a considerable influence upon the monthly amount but not upon the yearly one. *Subject Headings:* **1. Evaporation from lakes 2. Lake Kawaguchi, Japan.**—*Author's abstract.*

12.6–240 551.573:551.501

Keyman, J. Q. (*Netherlands Met. Inst.*), **Beschouwingen over de geldigheid van de formule van Penman voor de verdamping van het vrije wateroppervlak.** [Considerations about the validity of the formula of Penman for the evaporation from an open water surface.] *Nederlandse Centrale Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek. Commissie voor Hydrologisch Onderzoek, Verslagen en Mededelingen*, No. 4:60–69, **1960.** 6 figs., 3 tables, 3 refs., 6 eqs. English summary p. 60–61. **DWB**—The Penman formula is based on a simplified energy balance, the Dalton formula and the Bowen ratio. The limitations of these relations are pointed out. A description of the dependence of evaporation on meteorological circumstances (clear sky, overcast sky, no net radiation, night conditions) is given. A few tests of the formula are presented. Particularly the evaporation from Lake Ijssel, computed with the Penman-formula, is compared with the measurements with floating pans. A good agreement is obtained for monthly totals averaged over 11 years, when a correction for the heat capacity of the water mass is applied. Agreement is less good but still satisfactory for the summer months of 1947. It is concluded that the Penman formula gives a good approximation of the evaporation from open water, but that a correction for the heat capacity of the water is often necessary when periods shorter than a year are considered. *Subject Headings:* **1. Evaporation from water surfaces 2. Penman's method of evaporation calculation 3. Lake Ijssel, Netherlands.**—*Author's abstract.*

Water Balance, Level and Level Variations

12.6–241 551.577:551.579.4:551.481.1(26.05)

Brunk, Ivan W. (*Meteorologist, U. S. W. B., Chic.*), **Precipitation and the levels of Lakes Michigan and Huron.** *Journal of Geophysical Research*, Wash., D. C., 64(10):1591–1595, Oct. **1959.** 8 refs., 6 eqs. **Comment** by Zane Spiegel, and **Reply** by Brunk, *Ibid.*, 65(3): 1076–1079, March **1960.** 9 refs. **DLC.** Also issued in *Conference on Great Lakes Research, 3rd, Ann Arbor, Mich., May 6–7, 1959*, **Proceedings,** pub. **1960.** p. 145–150. 8 refs., 6 eqs. **DWB**—A number of correlations for precipitation and the levels of Lakes Michigan and Huron indicated a computable relationship and also an apparent lag between precipitation and its effect. When land-area precipitation only was considered, a correlation of lake level with four-year precipitation data gave a correlation coefficient of 0.69. A correlation of precipitation and the difference in annual mean levels indicated a correlation coefficient of 0.68. In order to include the effect of additional variables a correlation of water-year precipitation on a two-year basis and net basin supply was made. A correlation coefficient of 0.79 was obtained, and a lag between precipitation and its effect was again indicated. Monthly precipitation values were correlated with seasonal changes in level, and correlation coefficients of 0.85 and 0.81 were obtained with antecedent precipitation and the seasonal rise and antecedent precipitation and the seasonal fall in levels, respectively. Finally, it is pointed out that geological conditions in the Michigan-Huron basin provide a physical reason for the indicated lag between precipitation and its effect. *Subject Headings:* **1. Precipitation effects on lake levels 2. Precipitation correlations 3. Lake Michigan 4. Lake Huron.**—*Author's abstract.*

12.6–242 551.556.8:551.482,215.78(47)

Karaushev, A. V., **Issledovanie i raschet sgonno-nagonnykh deniveliatsiĭ Tsimlianskogo vodokhranilishcha.** [Investigation and calculation of wind-induced water level variations in the Tsimlyansk reservoir.] *Leningrad. Gosudarstvennyĭ Gidrologicheskiĭ Institut, Trudy*, No. 66:17–50, **1957.** 17 figs., 11 tables, 10 refs., 19 eqs. **DWB**—Using data on wind velocity and direction over the Tsimlyansk reservoir and on inflow and outflow of water obtained during the fall of 1952, the author investigated the wind-induced variation in water level of this reservoir and attempted to verify the validity of methods of calculating such variation in level developed by him. The contents of this study include the following: the state and regime of the Tsimlyansk reservoir during the fall of 1952 as indicated by data on mean daily inflow

and outflow, total monthly evaporation from the surface, monthly precipitation, mean decada and mean daily variations in wind velocity, etc.; analysis of several observed instances of wind induced variations in water level; the characteristics of wind induced variations in level; the formulas for computing wind induced changes in level developed by the author, namely $\Delta Z = F_1Q^2 + F_2T$ for fall in level along a given length (along the longitudinal axis of the reservoir in the absence of mixed currents), and $\Delta Z = F_3EQ\sqrt{|T|} + F_2T$ in the case of mixed currents, and

$$\Delta Z_r = \frac{F_{1f} + F_{2c}T_c + F_{1c}F_{2f}T_f}{F_{1f} + F_{1c}},$$

(Z = fall of free surface, Q = depth of reservoir at the section, T = wind action on the water surface, F = module of resistance, c = index associated with channel values and f = index associated with the flooded part.) The results of computation of wind induced changes in level and comparisons of measured with calculated levels are presented in tables and analyzed. *Subject Headings:* **1. Water level variations 2. Wind effects on reservoir water levels 3. Tsimlyansk reservoir, Rostov Region, U.S.S.R.**—*I.L.D.*

12.6–243 551.577:551.573:551.579(285:47)

Bogoslovskiĭ, B. B., **O raĭonirovanii ozer SSSR po vodnomu balansu.** [Classification of lakes in the U.S.S.R. according to the water balance.] *Vsesoiuznyĭ Gidrologicheskiĭ S"ezd, Trudy* [*3rd Conference, Oct. 1957*], Vol. 4, issued **1959.** p. 17–25, 3 figs., 17 refs., eq. **DWB** (M79 V985tr), **DLC** (GB651.V83)—Classification of lakes can be made on the basis of several criteria: thermal changes, origin of lake bed, hydrochemistry, sedimentation, etc. Zonality plays an important role in the lake regime and therefore criteria should be established for zonal classification. Such criteria are water balance and level variations, morphometrics of lakes and their catchment areas, mineralization and salinity of water, thermal regime and sediments. For each criterion, the appropriate algebraic factor is computed. A coefficient of lake surface $K = P_0/F$ (P_0 = average surface of lake, F = surface of catchment area) is used to classify water balance. Two main zones are established in the U.S.S.R., the humid and the arid. One type of lake is classified in the first zone: the runoff fed and runoff depleted. There are two types in the second zone: runoff fed and evaporation depleted and the direct precipitation fed and evaporation depleted. In each type, several subtypes are established depending on quantitative relations of the water balance components. Eleven such subtypes are established. This permits drawing charts of lake zones for different values of coefficient K. *Subject Headings:* **1. Lake hydrology 2. Classification of lakes 3. Water balance of lakes 4. U.S.S.R.**—*J. Němec.*

12.6–244 551.579.5:551.573:627.1(47)

Khalatian, O. I., **Opyt izucheniia vodnogo balansa Khramskogo vodokhranilishcha.** [Experimental investigation of the water balance of the Khrami reservoir.] *Vsesoiuznyĭ Gidrologicheskiĭ S"ezd, Trudy* [*of 3rd Conference, Oct. 1957*], Vol. 4, issued **1959.** p. 200–206. 3 figs. **DWB** (M79 V985tr), **DLC** (GB651.V83)—The water balance of the reservoir from the dam on the Khrami River (an affluent of the Kura River) has been observed for 9 years. Special attention has been given to filtration losses. Most accurate methods of water balancing have to be used for this purpose. Water balance periods should not be shorter than one month. Winter months should be considered as one period. Filtration losses so computed show a direct proportion to water level. *Subject Headings:* **1. Water balance of reservoirs 2. Reservoir effects on water balance 3. Khrami reservoir, U.S.S.R.**—*J. Němec.*

12.6–245 551.577:551.579:551.573:551.481.1(285:57)

Afanas'ev, A. N., **Vodnyĭ balans oz. Baĭkal.** [Water balance of Lake Baikal.] *Vsesoiuznyĭ Gidrologicheskiĭ S"ezd, Trudy* [*of 3rd Conference, Oct.* 1957], Vol. 4, issued **1959.** p. 174–184. 4 figs., 6 tables. **DWB** (M79 V985tr), **DLC** (GB651.V83)—After a short geographical description of Lake Baikal, the following elements of its water balance are examined: precipitation in the lake, inflow resulting from watershed runoff, outflow through Angara River

and evaporation from lake surface. Variation of lake surface and water level are compared to different elements of water balance and monthly, annual and long term balance are discussed. Main source of variation of balance elements are climatic changes; variations of the water level correspond closely to inflow-outflow relation. *Subject Headings:* **1. Water balance of lakes 2. Lake hydrology 3. Lake Baikal, Siberia, U.S.S.R.**—*J. Němec.*

12.6–246 551.501.9:551.457(438)

Bulavko, A. G., **Pervaia bolotnaia stantsiia v Pol'she.** [The first swamp station in Poland.] *Meteorologiia i Gidrologiia*, Moscow, No. 11:70–71, Nov. 1959. **DWB, DLC**—The State Hydrometeorological Institute of Poland opened the first swamp hydrometeorological station in 1958. This station is located about 35 km east of Belostok, near the Russian border. There is located one of the largest marshes in Poland—the Mikhalovo-Imshar—with an area of 42.8 km². The principal task at present is a quantitative study of the water balance. For this purpose 9 rainfall stations have been established. The flow of the Suprasl' River is measured at Mikhalovo which has a catchment area of 49.4 km². At Mikhalovo evaporation is studied by the heat balance method. Observations on the swamp and ground water regime are made at 5 points. They are made in holes distributed across the swamp. Meteorological observations on atmospheric temperature and humidity (at heights of 5, 50 and 200 cm) and wind speed and densities, etc. were begun at Mikhalovo in 1958. The hydrochemical laboratory investigates also the chemical composition of the water. *Subject Headings:* **1. Swamp water balance 2. Ground water studies 3. Chemical composition of water 4. Belostok, Poland 5. Mikhalovo, Poland.**—*I.L.D.*

12.6–247 551.579:628.1:519.24

Hurst, H. E. (*Ministry Pub. Works, Egypt*), **The problem of long-term storage in reservoirs.** *I. U. G. G. Association of Scientific Hydrology, Bulletin d'Information*, No. 3:13–27, **1956.** 5 figs., 4 tables, 5 refs., 5 eqs. **DWB**—An effort to use statistical methods to solve problems and make predictions on long-term storage in reservoirs. The approach of the writer is that of solving problems of irrigation, power and flood protection. Calculations of storage from past records of phenomena, when the supply is used and when only part of the supply is used, are developed. An outline of the general theory underlying long-term storage is given. The records of the phenomena to be regulated are inadequate to give a solution. Finally, it is noted that such data as are given represent only probabilities of varying degrees. *Subject Headings:* **1. Long-term water storage 2. Reservoir water storage 3. Water conservation statistics.**—*E.Z.S.*

F4. ICE

See: **Aerial photographs of sea ice forms,** 12.6–48; **Turbulent heat exchange between ice cover and air, central Arctic** (Iakovlev), 12.6–60; **Micromet. at Fletcher's Ice Island, T-3** (Larsson), 12.6–427.

F5. GLACIOLOGY

See: **Study of central Himalayan glaciers** (Jangpangi), 12.6–58; **Ice-cap access route, Narssarssuaq** (Leighty, Poulin), 12.6–59; **Ellesmere Is. Ice Shelf met. program** (Lotz), 12.6–428.

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION (551.501)

See also: **Aerological investigations of the boundary layer** (Vorontsov), 12.6–15; **Met. instruments and measurements** (Stružka), 12.6–18; **Snow survey measurements, Calif.**, 12.6–35; **Application of weather radar to fallout prediction** (Austin), 12.6–37; **Weather station index**, 12.6–43; **Special World Intervals** (Pushkov), 12.6–51; **All-sky camera data for Alaskan stations** (Young, *comp.*), 12.6–57; **Soviet Antarctic station** (Mirny), 12.6–64; **Region of relative inaccessibility at the South Pole** (Nudel'man), 12.6–67; **Met. rocket network** (aufm Kampe), 12.6–72; **Observers network, Uruguay** (Avegno), 12.6–75; **Climatic discomfort, Kimberleys** (Gaffney), 12.6–118, **Proposal for locating weather ships in the Far East** (Il'inskiĭ), 12.6–123; **First swamp station in Poland** (Bulavko), 12.6–246; **Upper air wind studies** (Groves), 12.6–277; **Investigation of heat and water balance, Centerton, N. J.** (Mather, Hacia), 12.6–280; **Instrumental measurement of cloud base height** (Bozhevikov), 12.6–286; **On the sufficient number of rainfall stations for a small basin** (Kawabata), 12.6–402; **Measurements of cloud droplet charge** (Allee, Phillips), 12.6–451.

12.6–248 551.501:551.573:551.48

†Konstantinov, A. R. and Pushkarev, V. F., **Nabliudeniia nad ispareniem s poverkhnosti vody i pochvy na territorii SSSR.** [Observations of evaporation from a water surface and the ground in the U.S.S.R.] *Akademiia Nauk SSSR. Mezhduvedomstvennyĭ Komitet po Provedeniiu MGG, Nekotorye problemy meteorologii*, No. 1:72–95, **1960.** 6 figs., 5 tables, 3 charts, 23 refs. English summary p. 94–95. **DWB** (M(055) N418ne)—Reasons are given for selection of a standard apparatus for measuring evaporation from water surface of evaporation pool 20 m² in area and 2 m in depth. A joint study of the work of an American standard evaporator of the A class and GGY-3000 evaporator (U.S.S.R.) showed that the establishment of an evaporator of the A class on the water surface breaks the wind regime over the water surface, distorts thermal regime of water masses as a result of which the apparatus gives highly overestimated magnitudes of evaporation. The indications of GGY-3000 evaporator are much more reliable. Daily and seasonal changes of evaporation are considered and a map of norms of evaporation from water surface over the U.S.S.R. territory is given. Alongside with the description of methods of measuring evaporation from the Earth's surface (hydraulic and GGY-500 evaporators, method of turbulent diffusion), daily and seasonal changes of evaporation from the Earth are considered. The dependence of evaporation from the Earth on meteorological conditions (evaporativeness), ground moisture and the type of agricultural crop has been considered. *Subject Headings:* **1. Evaporation measurement techniques 2. Evaporation from water surfaces 3. Evaporators 4. U.S.S.R.**—*Authors' abstract.*

12.6–249 551.501:551.578.11

Mészáros, Ernő and Wirth, Endre, **Zamechaniia o metode Sivadiana dlia izmereniia spektra dozhdevykh kapel'.** [Some remarks on Sivadian's method of measuring raindrop spectrum.] *Időjárás*, Budapest, 63(6):329–332, Nov./Dec. **1959.** 3 figs., 2 refs. English summary p. 329; Hungarian summary p. 332. **DLC**—The different results obtained by the Sivadian method compared with those resulting from other methods are due to difference in the time of incidence as a function of drop size. The method of necessary calibration is described. The connection between the diameters of real drops and those measured on the plate are illustrated by the calibration curve. The relative error of spot and real drop diameters is demonstrated in the second diagram. The distribution curve of the measurement of Nov. 12, 1959, showing the difference before and after the correction (third diagram), proves the indispensability of the calibration curve. *Subject Heading:* **1. Raindrop size distribution measurement techniques.**—*O.T.*

12.6–250 551.501:551.578.11

Rovinskiĭ, F. Ia., **Novye metody registratsii vodnykh kapel.** [New method of recording water drops.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, 7:1076–1078, July **1959.** 3 figs.,

10 refs. **DWB, DLC**—The author describes a method of recording water drops by means of the gelatin layer of an ordinary photographic plate containing crystals of NaI and $Ag_2C_2O_7$. The preparation of the surface of the plate is described in detail. The water droplets impinging upon the gelatine and diffusing within it dissolve immediately the crystals of NaI in the gelatine. A sufficient number of iodine ions are formed, these in turn rapidly produce a AgI precipitate from the silver bichromate as a result of a great difference in solubility. As a consequence there appear white circles of exactly limited area, upon which the water drops had spread on falling upon the gelatine surface on the reddish brown background of the bichromate gelatine. This method enables the measurement of water drops from 3μ to several millimeters in diameter. A simple method for recording water drops involves capturing the drops directly upon a gelatine layer of a photographic plate which is rendered transparent by a preliminary fixture. The water crystals on falling upon the gelatine layer of the photographic plate from which salts of silver halides had been removed by hypersulfate, form after evaporation residues of dark center in a white background which are distinctly visible in the field of a microscope. Aerosols containing haloid ions can be investigated with Boyce's filter paper with bichromate of silver or Farlow's method for recording drops 2.5 to 400μ in diameter if they contain more than 0.5% haloid ions by weight. *Subject Headings:* **1. Drop size measurement techniques 2. Water drops.**—*I.L.D.*

12.6–251 551.501:551.573:581.11

Suzuki, S. and Fukuda, H. (*both, Univ. Tokyo*), **Experiments on evapotranspiration in field and of the adaptability of the formula in Japan.** *Journal of Agricultural Meteorology*, Tokyo, 15(3):105–109, Jan. 1960. 4 figs., 4 tables, 3 refs. In Japanese; English summary p. 109. **DWB**—The results obtained in the experiments in Kanagawa Pref. on evapotranspiration of winter barley and upland rice are analyzed, and main points are as follows: 1) effects of growth and melting of ice filaments grown on ground surface in winter on the daily fluctuations of evapotranspiration were treated; 2) the amount of water to be supplied to the farm with upland rice was determined and proved to be near the one planned before for this farm; 3) comparisons of the accuracy of determining evapotranspiration by various formulas were made and a new method by the authors was proved to get more reliable and practical results than others. *Subject Headings:* **1. Evapotranspiration calculations 2. Evapotranspiration formula accuracy 3. Kanagawa Prefecture, Japan.**—*Authors' abstract.*

12.6–252 551.501.4:551.573

†Brogmus, Willi, **Zur Theorie der Verdunstung der natürlichen Erdoberfläche. Mit Anhang: Verdunstungsberechnungen auf Grund der neuen Verdunstungsformel nebst Diskussion ihrer Ergebnisse.** [The theory of evaporation from natural earth surfaces. With appendix: Evaporation calculations on the basis of a new evaporation formula and discussion of results.] *Hamburg. Seewetteramt, Einzelveröffentlichungen*, No. 21, 1959. 33 p. 34 refs., 63 eqs. (16-p. appendix with 3 figs., 5 tables, 3 refs., 9 eqs.) **DWB**—Evaporation formulas for any stratification conditions developed hitherto on the basis of turbulence theory are presented and new formulas for determining evaporation from natural solid or liquid surfaces of the earth are derived by taking into account the recent investigations of A. S. Monin and A. M. Obukhov. Similarly to the work of C. W. Thornthwaite and B. Holzman, F. Pasquill and N. F. Rider the evaporation formulas do not contain any hypothetical assumptions on a laminar or interboundary layer; they are based upon directly measurable observation within the ground layer above this laminar layer. The equations presuppose a knowledge of wind velocity, specific humidity and temperature at two levels within the atmospheric layer near the ground. The contents of this paper comprise the following: the vertical water vapor exchange in the atmosphere as based upon the undimensional diffusion equation $W = -A_q \cdot dq/dz$; the vertical wind profile in the atmospheric layer near the ground and the shearing stress equation in the case of adiabatic stratification according to the equations of Deacon-Laĭkhtman and the equations of Monin-Obukhov; evaporation formulas for natural earth surface for adiabatic stratification, non-adiabatic stratification according to the equations of Deacon-Laĭkhtman and Monin-Obukhov and the characteristics and computation of the resistance and evaporation coefficient. In the appendix the author illustrates the application

of the derived evaporation equations and examines their validity. It is demonstrated that th formulas contain all the parameters for the quantitative determination of evaporation. Variou sources of error are discussed. *Subject Headings:* **1. Evaporation calculation theories 2. Evapo ration formulas.**—*I.L.D.*

12.6–253 551.501.45/5:551.524.32:551.571.3

Kaczmarek, Zdzisław and Zielińska, Maria (*both, Politechnika Warszawska*), **Obliczani niedosytu wilgotnosci na podstawie miesięcznego rozkładu temperatury powietrza.** [Con putation of the humidity saturation deficit on basis of the monthly air temperature distribu tion.] *Przegląd Geofizyczny*, Warsaw, 4(3/4):219–230, **1959.** 4 figs., 4 tables, 10 refs., 19 eqs English summary p. 230. **DWB, DLC**—Computations of air saturation deficit on the basi of mean monthly temperature and mean monthly water vapor pressure are burdened by a error arising from nonlinear relation between temperature and saturated vapor pressure. It i shown that the magnitude of the error (and consequently the magnitude of the require correction) depends on the monthly distribution of temperature frequency and on the form o the relation $E=F(t)$. Using Pearson's theoretical frequency distribution, an approximatio method of determining the monthly temperature distribution is discussed and formulas fo calculating the corrections in determining the monthly mean saturation deficit are given. T facilitate the practical application of the derived relations, suitable nomograms have bee worked out. The proposed computation method is demonstrated on a numeral example *Subject Headings:* **1. Saturation deficit 2. Humidity calculations.**—*Authors' abstract.*

12.6–254 551.501.5:551.571

Kraus, E. B. (*Snowy Mts. Hydro-Elec. Authority, New South Wales*), **The reduction of humidity observations.** *Australian Meteorological Magazine*, Melbourne, No. 26:86–89, Sept **1959.** 3 figs. **DWB**—The possibility of constructing a relatively simple nomogram which allows conversion of any type of humidity specification into another is discussed and graphically represented. The use of the chart is illustrated by two skeleton diagrams to be used for pressures of 1000 mb (±50 mb) and for pressures other than 1000 mb. *Subject Heading:* **1. Humidity nomograms.**—*I.S.*

12.6–255 551.501.5:551.524.36

Lackey, Earl E. (*Quartermaster Res. & Eng. Center, Mass.*), **A method for assessing hourly temperature probabilities from limited weather records.** *American Meteorological Society, Bulletin*, 41(6):298–303, June **1960.** 5 figs., 2 tables, 5 refs., eqs. **DWB, DLC**—The frequency distribution of hourly temp. for any month may be assessed with a considerable degree of confidence by use of a nomograph when only the mean monthly temp. and the corresponding monthly extremes are known. Moreover, the method is readily adaptable to computing-machine tabulation and solution. *Subject Heading:* **1. Temperature probability nomograms.**—*Author's abstract.*

12.6–256 551.501.5

Learmonth, A. T. A. and Nath Pal, Mainindra, **Method of plotting two variables (such as mean incidence and variability from year to year) on the same map, using isopleths.** *Erdkunde*, Bonn, 13(2):145–150, May **1959.** 3 figs., 3 refs. German summary p. 145. **DWB, DLC**—The isopleth maps used for illustration of the method of plotting two variables are from Mysore State, India. One map presents cholera mortality, the other one shows median monthly incidence from year to year for the 30-year period 1926–1955. The method employs vertical, 45° left and right, and horizontal hatching of different interspacing and coarseness, whereby it is possible to present two variables on an isopleth map. Comparison with choropleth mapping is given. *Subject Heading:* **1. Isopleth maps.**—*W.N.*

12.6–257 551.501.5:518.3:551.510.4:551.521.3:551.593.54

Slonim, I. Ia., **A nomogram for calculating the diameter of particles from turbidity by means of the Mie equation.** *Optics and Spectroscopy*, Wash., D. C., 8(2):130–131, Feb. **1960.**

fig., 3 refs., 5 eqs. **DWB, DLC.** Transl. of original Russian in corresponding issue of *Optika i Spektroscopiia*, Moscow. For facilitating the computation in the region of $m = 1.05$ to 1.30, which is particularly important in studying dispersions of polymers, a nomogram has been constructed. A key and example are given. Particle size vs turbidity are plotted and the diameter of the particle determined from turbidity. The accuracy of computation is of the order of 1 to 2%. Increase in the accuracy and range of particle sizes are obtained by using the light scattering tables based on the Mie theory. *Subject Headings:* **1. Particle size measurement nomograms 2. Dispersion of polymers.**—*E.Z.S.*

12.6–258 551.501.7:551.508.822

Väisälä, Vilho, **New diagram paper for radiosonde stations.** *Vaisala News*, Helsinki, No. 2:3–11, July **1959.** 2 figs., map, form (fold. in pocket), 8 refs., 17 eqs. **DWB**—The new diagram paper used for the plotting of sounding results as a function of air pressure is described. The paper consists of a discussion of the lay-out of the new aerogram, basic grid and adiabats, theory of the height scales and the construction of the height scales. A world-wide map of stations using Vaisala radiosondes is shown and a copy of the new Vaisala aerogram is enclosed. *Subject Headings:* **1. Plotting paper 2. Radiosonde calculations 3. Aerograms.** —*I.S.*

12.6–259 551.501.7:551.508.822

Huovila, Seppo, **New rapid way to compute PTU-soundings.** *Vaisala News*, Helsinki, No. 2:12–13, July **1959.** 3 figs. **DWB**—The main idea of this new method is to draw individual scales of pressure, temperature and humidity for each radiosonde. The scales are drawn on the basis of the calibration curves. The accessories used for the new method, in addition to the ordinary PTU-Recording Receiver are listed, and the actual computing of PTU soundings is described. *Subject Heading:* **1. PTU sounding computations.**—*I.S.*

12.6–260 551.501.7:621.397.9

Wilska, Matti (*Vaisala Oy.*), **Automatic recording of PTU soundings.** *Vaisala News*, Helsinki, No. 4:15, Dec. **1959.**—For the purposes of automatic recording, the Swedish Meteorological and Hydrological Institute introduced a "facsimile recorder" method, using wet electrolytic paper. It is reported that Vaisala Oy experimented with a similar facsimile instrument "Erifax" in 1959. The instrument was connected to an ordinary Vaisala-type PTU Recording Receiver. A parallel sounding was simultaneously performed with a second PTU Recording Receiver using the dry electrolytic facsimile paper. On comparison of the results of the two systems it was found that the dry type paper was the more satisfactory one. *Subject Heading:* **1. PTU sounding recorders.**—*I.S.*

12.6–261 551.501.75:551.557:519.2

Durst, C. S. (*formerly, Met. Off., London*), **The statistical variation of wind with distance.** *Royal Meteorological Society, Quarterly Journal*, 86(370):543–549, Oct. **1960.** 3 figs., 2 tables, 7 refs., 2 eqs., 4 appendices. **DLC, DWB**—Correlation coefficients have been formed between the winds at pairs of points, the correlation being made between components along the line joining the points and also between components at right-angles. The original purpose was the derivation of the effective winds experienced by aircraft. However, certain results are found which appear to throw light on the application of turbulence theory to the large-scale pattern of winds and hence it is thought that the results may be of more general interest. *Subject Headings:* **1. Wind plotting aids 2. Synoptic wind patterns 3. Statistical studies of winds.**—*Author's abstract.*

OBSERVATIONAL DATA (551.506)

See also: **Upper air data, Australia**, 12.6–26; **Met. report on Operation Redwing**, 12.6–27; **Phenological tables, E. Germany** (Seyfert), 12.6–36; **Annual met. tables, Falkland Islands**, 12.6–38; **Upper winds statistics, N. Hemisphere** (Crutcher), 12.6–46; **First Continental Expedition, 1955–1957, Antarctica**, 12.6 61; **Weather obs. at sea** (Schilling), 12.6–124; **Met. obs. by German lightships, North and Baltic Seas**, 12.6–125; **Atlas of oblique incidence ionograms** (Agy et al.), 12.6–179; **Twilight obs. of the lithium line** (Delannoy), 12.6–187; **High altitude wind data** (Armstrong, Garrett), 12.6–276; **Solar radiation and sunshine, Jerusalem** (Ashbel), 12.6–337; **Problem of frost, Lithuania** (Ol'shauskas), 12.6–349; **Possible occurrence of freezing temps, Walla Walla and Yakima Valleys** (Phillips), 12.6–350; **Probable occurrence of freezing temps. in Wenatchee-Okanogan fruit producing area** (Phillips), 12.6–351; **Mean monthly absolute humidity at station level, U.S.S.R.** (Elliott), 12.6–373; **Halo phenomenon** (Singleton et al.), 12.6–447.

12.6–262 551.506.3:551.582.2/3(7

*Canada. Meteorological Branch, **Climatic summaries for selected meteorological statio in Canada, Vol. 2 (Revised), Humidity and wind.** Toronto, **1959.** 141 p. Almost entire tables. "Replaces earlier issue of Vol. 2, pub. **1948**, and now out of print." **DWB**—Th humidity data included in this publication are a summary of humidity observations made approximately 200 meteorological observing stations throughout Canada during 1941–19 inclusive. Average wind tables are included which are based on anemograph data from 19 to 1954. This volume also contains short texts on humidity and wind, maps and char showing the features of the distribution of humidity and wind across Canada, and short tabl of extremes in both cases. An index lists the stations from which data are shown. *Subje Headings:* **1. Climatic data summaries 2. Humidity data 3. Wind data 4. Canada.**

12.6–263 551.506.3(415):551.510.7

*Eire. Meteorological Service, **Measurements of radioactivity of precipitation, settle dust and airborne particles in Ireland, 1956–1959.** Dublin, **1960.** 66 p. 8 p. text. Almo entirely tables. **DWB**—This publication consists of measurements of artificial radioactivit of precipitation, air, total fall-out and tap water, made by the Irish Meteorological Service fro May 1956 to Dec. 1959. The sampling sites and measuring procedures are explained. Th data consists of daily and monthly mean measurements at Valentia Observatory and at Dubli City. Measurements for April, 1960 include airborne, total-fallout, tap water and precipitatio and settled dust at both sites, airborne daily and monthly measurements, weekly sampling o total fallout and specific radioactivity of tap water are listed separately. Measurements a Belmullet 1958, 59 are compared with those at Dublin, 1959. *Subject Headings:* **1. Artificia radioactivity measurement data 2. Radioactive precipitation 3. Radioactive tap wate 4. Ireland.**—*E.Z.S.*

12.6–264 551.506.1:551.582.2(83) 551.506.8(83

*†Kunkel, Gunther, **Meteorologisch-mikroklimatologische Beobachtungen in Valdivi (Südchile).** [Meteorological microclimatological observations in Valdivia, South Chile. *Akademie der Wissenschaften, Berlin. Klasse für Chemie, Geologie und Biologie, Abhandlunge* No. 5, **1959.** 413 p. (104 p. of text). 53 figs., numerous tables, 40 refs. German and Spanis summaries p. 101. **DWB** (M82.1/83 K96me)—This report consists of descriptive and tabulate meteorological data based on observations in Valdivia, southern Chile from May 1957 to Apri 30, 1958. The first half (descriptive text) describes the climatic station at Valdivia and charac teristics of the yearly and monthly climate are summarized. Soil and water temperatures ar described and phenological studies are reported. *Subject Headings:* **1. Meteorological data— Valdivia 2. Microclimate data—Valdivia 3. Climate of Valdivia 4. Valdivia, Chile I. Schwabe, G. H. II. Lauer, W.**—*E.Z.S.*

12.6–265 551.506.3:551.521.1(418.3

McGreevy, G. (*St. Patrick's College, Maynooth, Eire*), **The circum-global radiation ir Dublin.** *Geofisica Pura e Applicata*, Milan, 44:265–270, Sept./Dec. **1959.** 2 figs., 3 tables

7 refs. German and English summaries p. 265. **DLC**—The note presents results of five years measurements of circum-global radiation in Dublin with two Bellani spherical pyranometers constructed and supplied by the Physikalisch-Meteorologisches Observatorium in Davos. It was found that the agreement of these remarkably simple instruments is very good over the whole period and that they are most suitable and convenient for climatological stations. *Subject Headings:* **1. Global radiation data 2. Dublin, Ireland.**—*Author's summary.*

12.6–266 551.506.3:551.542(729.9)

*Macky, W. A., **Pressure at mean sea level at Bermuda.** *Bermuda. Meteorological Office, Technical Note*, No. 9, **1959.** 16 p. 8 tables. **DWB**—This paper tabulates the corrected monthly means and some other data representing observations of atmospheric pressure in Bermuda since 1836. It is reported that in 1955 a fire destroyed all the original records since 1891, but a copy of the corrected monthly means for 1891 to 1931 was saved. In the annual summaries for latter years the errors are known. The information in this paper covers sources of data, location and individual description of 6 stations, time of observation, standard of time, correction to standard gravity, the units of pressure, monthly mean pressure and diurnal variation of pressure. *Subject Headings:* **1. Pressure data 2. Bermuda.**—*I.S.*

12.6–267 551.506.3:551.515.4(497.1)

*Malovčak, P. (*Hydromet. Service, Zagreb*), **Uzastopni grmljavinski dani u Osijeku i Crikvenici u razdoblje od 1901 do 1954 godine.** [Successive thunderstorm days at Osijek and Crikvenica for 1901–1954.] *Yugoslavia. Hidrometeorološka Služba, Vesnik*, 7(3/4):120–123 July/Dec. **1958.** 4 tables. **DWB**—Data on thunderstorms at Osijek and Crikvenica have been analyzed as to the occurrence of two or more successive days with thunderstorms; results of the analysis are presented in this paper. First and last dates, frequencies, and common occurrences at the two places of 2, 3 etc. days with thunderstorms are listed. Osijek had only two occurrences of 6 successive days with thunderstorms during 1901–1954, one case of 10 successive days (Aug. 7–16, 1938) and one case of 14 days (June 5–18, 1910). There were no cases of 7, 8, 9, 11, 12, 13 or 15 and more successive days with thunderstorms at Osijek. Crikvenica had no case of 5 successive days with thunderstorms, only one of 6 days and none of 7 or more. *Subject Headings:* **1. Thunderstorm data 2. Yugoslavia.**—*G.T.*

12.6–268 551.506.7:551.507.3:525.6:551.547

Angell, J. K. (*U. S. W. B., Wash., D. C.*), **Some evidence for tidal oscillations obtained from 300-mb transosonde data.** *Journal of Meteorology*, Boston, 15(6):566–567, Dec. **1958.** fig., 3 refs. **DWB, DLC**—Evidence for tidal oscillations at 300 mb based upon constant level balloon data are presented and compared with evidence for tidal oscillations at 100 mb based upon British upper air data (Johnson, 1955; *see* 6.5–204, May 1955, *Met. Abs.*). A graph showing the mean zonal and meridinal velocity components as functions of local time, their diurnal and semi-diurnal harmonic variation and the residual from transosonde data at 300 mb and British 100 mb upper air data are presented. Both sets of data support the hypothesis that since the solar thermal effect that induces a diurnal maximum pressure would be a maximum near the equator and since north of 30° lat. the flow would be baric (Coriolis force directed opposite to the normal pressure gradient force), v' (meridional velocity) should have its maximum value at approximately 1200 and u' (zonal velocity) its maximum value at 1800 local time. Also both sets of data support the concept of a vertical axis for the semidiurnal tide, with u' a maximum at 1000 local time when one of the two pressure maxima at the surface occurs and a minimum v' near 0700 local time. *Subject Headings:* **1. Constant level balloon data 2. 300 mb transosonde data 3. Upper air data.**—*I.L.D.*

12.6–269 551.506.7:551.510.5

House, D. C. (*U. S. W. B., Kansas City, Mo.*), **Remarks on the optimum spacing of upper-air observations.** *Monthly Weather Review*, Wash., D. C., 88(3):97–100, March **1960.** 2 figs., 2 tables, 7 refs., 8 eqs. **DWB, DLC**—The optimum time and space distribution of upper-air observations is considered in connection with the detection and prediction of instability lines—a mesoscale phenomenon. It is shown that the optimum spacing of observational stations is not only a function of the scale of the phenomena to be detected but of observational and

analytical errors as well. When these errors are considered the optimum network spacing c be determined with regard to the dimensions of the atmospheric feature requiring detecti Because actual data are lacking, inferences concerning the maximum time and space distribut of upper-air sounding stations suitable for the detection of instability lines are drawn fron theoretical atmospheric model. *Subject Headings:* **1. Upper air observation methods Instability line forecasting 3. Atmospheric models.**—*Author's abstract.*

12.6–270 551.506.7:551.57

Raubakken, Odd, **Den vertikale skyfordeling pa flyleia Fornebu-Vaernes-Bodöe.** [T vertical cloud distribution on the air route Fornebu-Vaernes-Bodö.] *Norway. Meteorologi Institutt, Scientific Report,* No. 7, **1959.** 25 p. 56 figs. **DWB** (M08.312.N863sc)—T study on the evaluation of cloud tops, comprises 200 cases (Sept. 1957–Sept. 1958) where t time difference between aircraft observations and radiosonde ascents was less than 6 hr. 82 of the total cases the altitude of the cloud tops was estimated satisfactorily, 87 cases we less reliable and 31 cases were dubious. Average cloud top altitude was 14,000 ft; in winter t convective cloud averaged 15,500 ft, or 4000 ft higher than in summer. Shower cloud to may exceed 20,000 ft in winter and during westerly gradient wind. The detailed results a presented graphically. *Subject Headings:* **1. Vertical cloud distribution 2. Cloud top heigh 3. Cloud top height data.**—*W.N.*

INSTRUMENT CARRIERS (551.507)

See also: **Sec. B2, . . .; Met. instruments and measurements** (Stružka), 12.6–18; **IGY,** 12.6–50; **Proposal for locating weather ships in the Far East** (Il'inskiĭ), 12.6–123; **Met. obs. by German lightships, North and Baltic seas,** 12.6–125; **Tidal oscillations obtained from 300 mb transosonde data** (Angell), 12.6–268; **Met. data report, Nike-Cajun NASA10.17** (Armendariz), 12.6–275.

12.6–271 551.507.3:551.508.95:551.510.4:551.510.5

Goldsmith, P. and Parham, A. G., **Apparatus for sampling the stratosphere.** *Harwe England. Atomic Energy Research Establishment, AERE-R* 3272, **1960.** 8 p. 4 figs., tabl **DWB** (M08.79 G786ap)—A balloon-borne apparatus for sampling air at heights of abo 100,000 ft is described. The apparatus, an early version of which has already been brief described was designed to collect samples of water vapor and carbon dioxide by means of vapor trap cooled in liquid nitrogen. It was carried to altitudes in the range 80,000 to 100,0 ft by balloon, of the type developed for cosmic ray work at the University of Bristol. Th total weight of the apparatus is 95 lbs, which includes 6 lbs of coolant. A photograph is show In the period April to June 1959 four samples were obtained at mean heights of 92,500, 91,30 90,000 and 80,000 ft. *Subject Headings:* **1. Stratospheric air sampling 2. Air-borne instru ments 3. Atmospheric composition measurement.**—*Authors' abstract.*

12.6–272 551.507.

Wurtele, M. G., **Transosonde Project.** California. Univ. at L. A. Dept. of Meteorology Contract Nonr-233(21), Final Report, Sept. 30, **1959.** 18 p. 7 figs., table, 13 refs. **DW** (M(051) C153tr)—The Transosonde Project was under the direction of J. Bjerknes. Th objectives, cost and operation of the project are outlined. The research covered four categorie among which were the collection and analysis of the data, the investigation of possible uses o transosonde data in synoptic metorology and forecasting and the theoretical research o Lagranian dynamics and the verification by the transosonde data. The second part of th study contains suggestions for the application of transosonde data in forecasting. Each i discussed. *Subject Headings:* **1. Transosonde Project 2. Transosonde data in forecasting** *N.N.*

12.6–273 551.507.321:533

Howe, John T. and Martin, E. Dale (*both, Ames Res. Center, Moffett Field, Calif.*), **Ga dynamics of an inflated sphere striking a surface.** *U. S. National Aeronautics and Spac Administration, Technical Note* D-315, April **1960.** 49 p. 25 figs., table, 12 refs., 39 eqs

DWB, DLC—A method for predicting the motion of an inflated sphere striking a hard surface has been developed in which the effect of the wave structure in the inflating gas is considered. The method predicts maximum acceleration, the velocity during impact, and the space-time trajectory of the top of the skin. The effects of the presence of an atmosphere are considered. The required size of a sphere that will not exceed a specified allowable acceleration is determined. Results of 52 examples are presented covering a wide range of initial conditions. *Subject Headings:* **1. Gas dynamics 2. Balloon motion.**—*NASA*

12.6–274 551.507.321:629.19

Simons, David G. (*Major, USAF (MC), Chief, Space Biology Br., Aero. Med. Field Lab., Holloman Air Force Base, New Mexico*), **Observations from the Manhigh II Balloon Capsule at 30 kilometers.** *International Astronautical Congress, Proceedings of the 8th Congress, Barcelona*, **1957**, issued Vienna, **1958.** p. 388–394. 3 figs., 2 refs. Also:Winzen, Otto C. (Pres., The Winzen Research Inc., Minneapolis), **The manhigh II balloon operation.** *Ibid.*, p. 460–463. 2 figs. **DLC** (TL787.I44)—Two papers describing, in order, the flight as experienced by the pilot from inside the capsule, and the preparation of the capsule and the flight operation as seen from the outside. The first paper, extensively illustrated, discusses four factors: 1) the sealed cabin with particular emphasis on selection and maintenance of its atmosphere, 2) the effects of isolation, 3) the effects of heavy primary cosmic rays on a human being as compared to the effects previously observed in animal experiments, and 4) the effectiveness of pilot performance. The second paper discusses the design and construction of the balloon and the gondola as well as the details of the flight operation. The trajectory and time vs. altitude curve of the flight are graphically represented. *Subject Headings:* **1. Balloon capsule manhigh II 2. Balloon instrumentation 3. Flight effects on humans.**—*I.S.*

12.6–275 551.506.7:531.5(71)

*Armendariz, Manuel, **Meteorological data report Nike-Cajun NASA 10.17.** Prepared for NASA by U. S. Army Signal Missile Support Agency, Fort Churchill, Canada, Aug. **1960.** 15 p. Mostly tables. **DWB**—Meteorological data for Nike-Cajun NASA 10.17 was collected by the Meteorological Branch, Fort Churchill Detachment, U. S. Army Signal Missile Support Agency. The data was taken prior to and during the firing and appears in this report, along with calculated ballistic data, in Appendices A, B, and C. *Subject Heading:* **1. Rocket launching 2. Ballistics 3. Fort Churchill, Canada.**—*Author's abstract.*

12.6–276 551.506.7:551.557:551.507.362.1

Armstrong, C. L. and Garrett, R. D., **High altitude wind data from meteorological rockets.** *Monthly Weather Review*, Wash., D. C., 88(5):187–190, May **1960.** 3 figs., table, 3 refs. **DWB, DLC**—This paper presents a preliminary summary of results obtained from meteorological rocket firings made by the United States Navy from Point Mugu, Calif., during the fall of 1959 and the winter of 1960. Although certain problems were encountered during these initial firings, it is felt that the wind data derived is as complete and as reliable as present acquisition read-out, and instrumentation techniques will permit. The data compare favorably with those obtained from high-level balloon soundings and tend to support previous ideas on wind flow in the mesosphere. *Subject Headings:* **1. Upper air wind data 2. Rocket-grenade wind determination 3. Wind measurement techniques.**—*Authors' abstract.* Ⓢ

12.6–277 551.501.75:551.557:551.507.362.1:546.33

Groves, G. V. (*University College, London*), **Upper-atmosphere wind studies by Skylark rocket sodium experiment.** *Nature*, London, 187(4742):1001–1002, Sept. 17, **1960.** 2 figs., photos. **DWB, DLC**—Experiments are being carried out using the Skylark rocket at the Woomera rocket range. Sodium is released along the flight path of the rocket at heights of from 94 to over 120 km just after sunset. The trail itself is illuminated by the sun and is bright enough to be photographed for a period of about 10 min. Twelve cameras have been used at three separated observing posts. By observing the similar features of the trail on the photographs from the different stations their positions are fixed by triangulations. Figures are given illustrating the east to west and south to north displacement of the trails and of the

degree of turbulence for one experiment under taken in Dec. 1958. Small scale turbulence wa apparent up to a height of 102 km being greatest at the lower heights. Above 107 km the ai appeared to be moving in large cells with vertical motions of 50 and more m/sec. *Subjec Headings:* **1. Upper air wind studies 2. Rocket soundings 3. Artificial sodium clouds** —*R.B.* Ⓢ

12.6–278 523.6:551.507.362.

Shklovskiĭ, I. S.; Esipov, V. F.; Kurt, V. G. et al. (*all, Shternberg State Astron. Inst.*) **An artificial comet.** *Soviet Astronomy AJ*, New York, 3(6):986–991, May/June 1960. 2 figs. 5 refs. Transl. of original Russian, **Iskusstvennaia kometa,** in *Astronomicheskiĭ Zhurnal* Moscow, 36(6):1073–1077, Nov./Dec. 1959. **DLC**—A method for effecting a substantia increase in the brightness of space rockets, by ejecting a cloud of luminescent gas to form ar artificial comet, is described. An account is given of the principal specifications of equipmen used in the observations of artificial sodium-cloud comets, and of the results of the artificia comet released on Sept. 12, 1959. Some of the properties exhibited by a sodium cloud expanding in a vacuum are reported. Attention is drawn to future perspectives in the sodiun artificial-cloud technique. *Subject Headings:* **1. Artificial sodium clouds 2. Rocket measurement techniques. I. Moroz, V. I. II. Shcheglov, P. V.**—*Authors' abstract.* Ⓢ

12.6–279 551.507.362.1:551.521.6:546.33:535.33

Vassy, A. and Vassy, E. (both, *Inst. Physique de l'Atmosphère, Faculté des Sciences, Paris*) **Relative intensities of *Na* lines in the emission of sodium ejected from rockets.** *Planetary and Space Science*, N. Y., 2(1):71–72, Oct. 1959. 5 refs. **DWB**—A short note on the recently undertaken series of experiments with French missiles to study the emission of the ultraviolet doublet 3303(4P-3S) and the intensity ratio of the lines 5893 and 3303. Two rockets were fired in French Sahara, the first on March 10 and the second on March 12; they reached an altitude of 126 km and 180 km, respectively. The two lines, yellow and ultraviolet, were obtained on two spectrums, one for each firing. The first spectrum, obtained in the evening twilight, gives no evidence of the 3303 line, the second at the morning twilight, gives a weak line at 3303. It is deduced that the intensity ratio of the two lines is variable. The determination of the ratio of the energy intensities received at ground level is also discussed. *Subject Headings:* **1. Rocket spectroscopy 2. Sodium lines 3. Artificial sodium clouds.**—*I.S.* Ⓢ

INSTRUMENTS (551.508)

See also: **Summaries of papers presented at IUGG/WMO Ozone Symposium,** 12.6–68; **Anemograph for recording wind components normal to a runway** (Morasca) 12.6–91; **New diagram paper for radiosonde stations** (Väisälä), 12.6–258; **New method of computing PTU-soundings** (Huovila), 12.6–259; **Apparatus for sampling the stratosphere** (Goldsmith, Parham), 12.6–271.

12.6–280 551.508:551.584(749) 551.501.9:551.584(749)

*Mather, J. R. and Hacia H., **Investigation of the heat and water balance at Centerton, New Jersey, May–July 1959.** Drexel Institute of Technology. Laboratory of Climatology, Contract Nonr 1617(00), Final Report; Publications in Climatology, Vol. 12, No. 1, **1959.** 48 p. 3 figs., numerous tables. **DWB** (M8 D777p)—This report first describes the observation site and the installation of micrometeorological instruments to measure the profiles of wind, temperature, and the atmospheric moisture near the earth's surface. Then follows a description of the observations which included air and soil temperature profiles, dew point temperature profiles, wind velocity profiles, solar and net radiation and potential evapotranspiration. Daily observations of most of these factors were obtained while a number of hourly runs covering up to 36 hrs in length were also made. All the data are tabulated and given in the appendices. The heat and moisture flux from the surface of the ground was computed on a number of different days. It is stated in conclusion that due to short period of observation it was not possible to draw any definite conclusions concerning the heat and moisture budgets at the earth's surface. *Subject Headings:* **1. Micrometeorological observation instruments 2. Heat balance 3. Water balance 4. Centerton, New Jersey.**—*I.S.*

12.6–281 551.508.21

Bushnell, R. H., **Measurements of infrared radiation in the atmosphere with two types of radiometers.** (In: Wisconsin. Univ. Dept. of Meteorology, Contract Cwb-9757, **Annual Report,** June **1960.** p. 14–18. 2 figs., 4 refs.) **DWB** (M(051) W811in) —In an experiment to confirm the effect of convection and conduction on the economical net radiometer, we have designed, built and flown with a radiometersonde one flux plate type of net radiometer along with its required d.c. amplifier. The shape of the net radiation curve measured by the flux plate agreed well with that measured by the economical net radiometer. *Subject Heading:* **1. Infrared radiation meters.**—*Author's abstract.*

12.6–282 551.508.21

Kucherov, N. V., **Pribor dlia pirgeliometricheskikh izmereniĭ.** [An instrument for pyrheliometric measurement.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy,* No. 69:100–103, **1957.** 3 figs., 2 tables. **DLC**—Difficulties in calibration and operation of Ångström pyrheliometer in observation of solar radiation are briefly outlined in view of the use of a new type of pyrheliometer designed by the Main Geophysical Observatory. Details of construction, principles of action and method of observation are described with drawing and calibrated characteristics. *Subject Heading:* **1. Pyrheliometers.**—*N.P.S.*

12.6–283 551.508.23

Schulze, A., **Die Auswertung der Registrierungen des Sonnenscheinschreibers Campbell-Stokes.** [Evaluations of the recordings of the Campbell-Stokes sunshine recorder.] *Meteorologische Rundschau,* Berlin, 13(1):31–32, Jan./Feb. **1960.** table, ref. **DWB, DLC**—The German and Dutch procedures for evaluating the records of Campbell-Stokes sunshine recorders differ in that the former give greater values to the foci and slight browning. In order to determine the accuracy of the evaluation, the author examined the valuation of monthly sunshine duration records for Hamburg and Hohenpeissenberg evaluated by the Dutch and German procedures. In Hamburg the German values are considerably above the Dutch evaluations, while in the case of Hohenpeissenberg no noticeable differences are apparent between the two evaluations. An examination of the differences showed that the effect of a divergent estimation of the circular burn traces is rather slight. It is concluded that the subjectivity of the evaluator is one of the principal causes of divergent evaluation of sunshine recordings. Hence adoption of similar directions would not eliminate differences if subjective factors are not minimized. *Subject Heading:* **1. Campbell-Stokes sunshine recorder.**—*I.L.D.*

12.6–284 536.53:551.508.29:551.508.79

Höhne, Werner, **Ein oszillierendes Thermoelement und seine Anwendung bei Temperatur- und Feuchtemessungen.** [Oscillating thermoelement and its use during temperature and humidity measurements.] *Angewandte Meteorologie,* Berlin, 3(10):312–315, April **1960.** fig., 7 refs. German and English summaries p. 312. **DWB**—Description is given of a thermocouple which is caused to oscillate rapidly in an a/c field. This is effected by a very small maniperm magnet, oscillating in the field of an a/c magnet, fixed to the thermocouple. The device may be used for measurements of air temperature, without solar radiation being shielded, and for psychrometric measurements of atmospheric humidity. *Subject Heading:* **1. Thermocouples.**—*Author's abstract.*

12.6–285 551.508.71

Alianchikova, G. N., **Gigrometr kondensatsionnyĭ.** [Condensation hygrometer.] *Leningrad. Nauchno-Issledovatel'skiĭ Institut Gidrometeorologicheskogo Priborostroeniia, Trudy,* No. 7:55–62, **1959.** 5 figs., 3 tables. **DWB** —A description of a portable condensation hygrometer for use in station networks for making controlled observations during the winter and for comparing the recordings of stations with the recordings of this hygrometer. The hygrometer consists of a water vapor condensor with a sensitive element of a bimetallic thermometer, a counting tube, an illuminator, a case and a base. The construction of the apparatus, the properties of its various parts and their operation are described with the aid of diagrams. A phase transformer providing a solid condensate in the mirror, where atmospheric temperature is below zero, is placed upon the mirror of the hygrometer. The temperature of

the mirror surface is measured by the bimetallic thermometer whose sensitive element within the body of the mirror. The movement of appearance and disappearance of th condensate is determined either by the dark field method or by observations on the state of th mirror surface by an optical tube. The mirror is cooled by semiconducting thermal element in whose circuit are included a rheostat for regulating cooling rate of the mirror and a switch fo measuring current direction. The observations on the mirror can be made both in the dar and bright part of the day. The atmospheric relative humidity can be measured within limit of 20 to 100% at temperatures of 20 to −50°C. The limits may be expanded by using semi conductors with other properties facilitating greater cooling. *Subject Headings:* **1. Condensation hygrometers 2. Humidity measurement devices.**—*I.L.D.*

12.6–286 551.501.776:551.508.76

Bozhevikov, N. S., **K voprosu ob instrumental'nykh izmereniiakh vysoty nizhneĭ granits oblakov.** [Instrumental measurement of cloud base height.] *Leningrad. Nauchno-Issledovatel'skiĭ Institut Gidrometeorologicheskogo Priborostroeniia, Trudy,* No. 7:63–72, 1959 6 figs., 2 tables, 11 refs., eq. **DWB** -The importance of the height of the lower boundary o clouds to aviation owing to the variation of the height of the lower cloud boundary which ma amount to 100 m in 4–5 min is discussed on the basis of various studies on the fluctuation o lower cloud boundaries. It is pointed out that aviation could be served best under difficul meteorological conditions by instrumental means at a frequency of once every 30 sec. Th principles and functioning of various instrumental methods for measuring the height of th lower boundary of clouds are discussed with the aid of relevant equations and results obtained These methods include the following: method of pilot balloons, the kite method, the captive balloon method, cloud meters lifted aloft and dropped, method of airplane sounding, the search light method of KUZNETSOV, the search light method with modulation (pulsation) o light, light location method, the radar method and the pyrotechnical method. The data obtained with the various methods may differ because of (1) differences in physical principles utilized in the apparatus, (2) the variability of the height of the lower boundary of clouds which hinder the synchronously comparable measurements and (3) the different methods of measuring the desired magnitude and the absence of calibrated apparatus. The most promising methods are the search light method with pulsating light and light location devices. The fundamenta requirements of apparatus for determining the lower limits of clouds, the need for short term forecasts of the fluctuation of the lower boundary of clouds and a procedure for determining the probable deviation of the mean forecast height from the mean measured heights of the lower boundary of clouds are discussed. *Subject Heading:* **1. Cloud base measurement techniques.**—*I.L.D.*

12.6–287 551.508.822

Khakhalin, Viktor Stepanovich, **Sovremennye radiozondy.** [Modern radiosondes.] Moscow, Gosud-noe Energeticheskoe Izdat-vo, **1959.** 61 p. 40 figs., **DLC** (QC876.K53)— Basic information on the atmosphere (pressure, temperature and humidity) and the methods of its investigation are briefly described, in popular form, with diagrams and illustrations. Special attention is given to the modern equipment of the radiosondes with direct and coded signals. Various types of telemeters (coded, timing, number-impulse, high frequency and low frequency) are outlined with electronic and mechanical diagrams, including the Soviet radiosondes: (PZ-049) and (A-22-III), directional transmitters (PRB-0.5), (PRB-1.51) (A-35) and (A-36) and humidity transmitter (PKZ-1). Various foreign radiosondes are also briefly described with diagrams, including the radiosondes of the following countries: Finland, Japan, Eastern and Western Germany, India, Switzerland, France, England, Netherlands and U. S. *Subject Heading:* **1. Radiosondes.**—*N.P.S.*

12.6–288 551.508.822

Pobiiakho, V. A., **Zondirovanie atmosfery radiozondom A-22-III.** [Sounding of the atmosphere with an A-22-III radiosonde.] *Meteorologiia i Gidrologiia,* Leningrad, No. 8:35–37, Aug. **1959.** 3 figs., 2 refs. **DWB, DLC**—After briefly discussing the errors inherent in the comb radiosonde the author describes with the aid of photographs the construction of and functioning of the Radiosonde A-22-III which was developed in 1957 in the Scientific Instrumentation

Institute and put into operation in 1958. It consists of independent pressure, temperature and humidity elements and a code drum. The pressure unit is composed of two aneroids fastened to the frame. The heat compensation is attained by the bending of a bimetallic plate. The temperature element is a bimetallic plate, 0.13 mm thick of steel- invar and slightly magnetized steel. A thin cylindrical container protects the temperature unit against radiation. The moisture recorder is an organic pellicle which responds better to humidity changes than does hair. The drum consists of a frame and a code plate which is a thin metallic plate with a checkered surface. The radiosonde can measure pressure from 1050 to 10 mb. with a mean error of only ±2mb, temperature in the range of +40 to −76°C with a mean error of about ±0.5°, humidity between 15 and 100% with a mean error of ± 5. Also the signal recorder and its operation are described. *Subject Heading:* **1. Radiosondes.**—*I.L.D.*

12.6–289 551.508.822

Shaw, J. H., **Theoretical analysis of radiation errors of radiosonde temperature elements.** *Ohio. State Univ. Research Foundation,* Contract DA-36-039-Sc-78153, Technical Report No. 2, Jan. **1959.** 50 p. 6 tables, 16 refs., 63 eqs. **DWB** -In this report methods for estimating typical and extreme values of solar and thermal radiation fluxes for different atmospheric conditions and for altitudes about 50,000 ft are formulated. A theoretical investigation is then made of the factors which influence the equilibrium temperature of a body in the atmosphere exposed to this radiation flux and also exchanging heat by convection with the surrounding air. A relation is then developed from which a numerical evaluation of the radiation error of the ML-419 temperature element can be made. *Subject Headings:* **1. Radiosonde errors 2. Radiation errors.**—*Author's abstract.*

SYNOPTIC ANALYSIS AND FORECASTING (551.509)

See also: **Application of weather radar to fallout prediction** (Austin), 12.6–37; **Radio weather aids,** 12.6–42; **Weather station index,** 12.6–43; **Synoptic met. as practiced by the National Met. Center,** 12.6 44; **Met. rocket network for measuring atmos. parameters** (aufm Kampe), 12.6–72; **Estimating gradient wind from forecast contour charts** (Lumb), 12.6–92; **Microseisms, Lake Issyk Kul** (Gynkina, Masarakiĭ), 12.6–221; **Effects of heating on large scale disturbances** (Fleagle), 12.6–325; **Effect of Arctic on meridional circulation over Europe and western Siberia** (Rafailova), 12.6 -332; **Estimates of power spectra of large scale disturbances** (Rosenthal), 12.6–358; **Synoptic conditions for intense precip., Stanislav Region** (Racvskiĭ), 12.6 395; **Combined climate and persistence forecasts** (Buell), 12.6–419.

12.6–290 551.508.91:551.510.42:582.998:581.33

*†Sheldon, John M. and Hewson, E. Wendell, **Atmospheric pollution by aeroallergens, May 1, 1958–June 30, 1959.** Michigan. Univ. Engineering Research Institute, Research Grant E-1379(C), Progress Report, No. 3, June **1959.** 103 p. plus 102 appendices, 46 figs., 11 tables, 36 refs., eqs. **DWB** (M(051)M624pro)—A report of the yearly progress of the ragweed research program undertaken at the University of Michigan conducted by an interdisciplinary team of allergists, botanists, meteorologists and public health statisticians working together in close cooperation. Meteorological section describes largely the research on various types of samplers both in the wind tunnel and under natural conditions, and the conclusions thereof. The preseasonal experiment of 1958, an analysis of 1957 Jackson experiment data, and the in season experiment of 1958, also discussed. The section reports work, still in progress, on a theoretical study of diffusion from a continuous source utilizing the idea of ragweed-free area and the effect of that area on downwind concentration. The final plans for the test chamber and its construction details are given. Finally, the plans for 1959 are drawn. The paper is illustrated by graphs and diagrams. *Subject Headings:* **1. Atmospheric pollution instruments 2. Air sampling and analysis 3. Ragweed pollen count.**—*I.S.*

12.6–291 551.509:551.511.3

†Giao, Antonio, **The general problem of dynamical meteorology : an introduction to numerical weather forecasting.** *Dublin Institute for Advanced Studies. School of Cosmic Physics, Geophysical Bulletin,* No. 17, July **1959.** 2 figs., 21 refs., 230 eqs. **DWB, DLC**—An important

paper criticising and correcting the general opinion that the problem of dynamic meteorology is merely a particular case of the general problem of fluid mechanics completed by thermodynamics. The general approach and presentation adopted to elucidate the problem is mathematical First, the paper considers the different principles of conservation and equivalence basic to fluid mechanics and thermodynamics. These are expressed by partial differential equations between the characteristic properties of the fluids. It is shown that the thermohydrodynamical equations are very important to understand, at a given moment, the physical and mechanical structure of the macroscopic phenomena of the fluids. But they become quite insufficient in case of a real problem of evolution, such as numerical weather forecasting, the central problem of dynamical meteorology. The discussion thereafter turns to a consideration of the two prior possibilities of the solution of the thermohydrodynamical problem. *Subject Headings:* **1. Numerical weather forecasting 2. Dynamic meteorology.**—*I.S.*

12.6–292 551.509.3:551.511:551.513

Aubert, Eugene J. (*Geophysics Res. Direc. Air Force Cambridge Res. Center*), **Objective map analysis utilizing the concept of circulation and vorticity.** *Journal of Meteorology*, Boston, 16(4):427–435, Aug. **1959.** 4 figs., table, 6 refs., 4 eqs. **DWB, DLC**—A method of objective analysis is developed with the concept of circulation and vorticity. A sample set of analyses is presented and discussed. Average statistics are presented on the accuracy of the technique as a function of data density. In regions of sparse data, the analysis is shown to be improved by including the climatological normal in the analysis. *Subject Headings:* **1. Objective weather map analysis 2. Atmospheric circulation 3. Vorticity.**—*Author's abstract.*

12.6–293 551.509.312:551.577:681.14:621.3

Pone, R., **Perspectives de la prévision numérique des précipitations.** [Prospects for numerical precipitation forecasting.] *La Météorologie*, Paris, Ser. 4, No. 56:303–313, Oct./Dec. **1959.** 3 refs. French, English and Spanish summaries p. 303. **DWB**—During the last decade, the quantitative forecasting of the state of the atmosphere has made rapid progress due to the facilities offered by electronic computers. However, much remains to be done to improve the results thus obtained and especially to achieve the forecasting of hydrometeors. The method used in recent research was the method of models and among these the barotropic model constituted by a two dimensional fluid moving on a uniform globe without friction should be mentioned. Although far away from the real atmosphere, the barotropic model gave quite good results, but it gave insufficient information for forecasting hydrometeors. To improve this model, models with several layers or models in which the vertical structure of the atmosphere is represented by curves with one or more parameters were considered; they are adjusted at the beginning to reality. All these models introduce vertical velocities. This point is important for numerical forecasting of precipitation especially that which results from upward motions, with a fall in temperature, causing humid air masses to condense. As far as precipitation is concerned, the results so far obtained, by calculating the anticipated vertical motion, are not yet satisfactory. Taking into account the orographic effects and the fine structure of the atmosphere, an improvement can be expected for short range forecasts (24 to 48 hrs). The fundamental obstacle that remains is the strong dispersion of the intensity of precipitation for neighboring places, especially in the case of showers and storms. The forecast for a given place will therefore necessarily affect the parameters of the law of probability. Particularly for the barotropic model, a study of the relations between the surface topography at 500 mb and the intensity of precipitation could offer progress in the forecast of precipitation. In view of the improvement of the models introducing vertical velocities, models introducing the humidity variable, kinematic conditions, thermal exchanges between the atmosphere and the underlying surface, the influence of radiation, the atmospheric discontinuities and turbulent viscosity terms should also be considered. *Subject Headings:* **1. Numerical forecasting 2. Barotropic models 3. Stratification of atmosphere 4. Orographic effects 5. Precipitation forecasting 6. Electronic computers.**—*A.V.*

12.6–294 551.509.313

Dubov, A. S., **Vliianie rel'efa na peremeshchenie baricheskikh tsentrov.** [Influence of topography on the movement of pressure centers.] *Meteorologiia i Gidrologiia*, Moscow,

No. 7:3–8, July 1960. fig., 11 refs., 21 eqs. **DWB, DLC** (QC851.M27) Beginning with PETTERSEN's equations for the speed of motion of barometric centres

$$v_x = \frac{z_x t z_{xy}}{(z_{xy})^2 - z_{xx} z_{yy}} \qquad v_y = \frac{z_y t z_{xx} - z_x t z_{xy}}{(z_{xy})^2 - z_{xx} z_{xy}}$$

where v_x and v_y are the components of the motion, z is the height of the isobaric surface and the suffices denote differentiation with respect to time (t) and space (x,y), an expression is derived for the additional component which would arise by changing the boundary conditions to allow for the effect of relief. These terms are such as to cause the barometric centres to skirt around the mountains in a clockwise direction. With weak pressure fields and steep slopes the effect of the terms could be significant. For slopes of the order of 50 m to 100 km the additional speed component would be about 2.5 m/sec. *Subject Headings:* **1. Numerical forecasting 2. Movement of pressure systems.**—*R.B.*

12.6–295 551.509.313:551.511.3

Knighting, E. and Hinds, Mavis K. (*both, Met. Off., Dunstable*), **A report on some experiments in numerical prediction using a stream function.** *Royal Meteorological Society, Quarterly Journal*, 86(370):504–511, Oct. 1960. 3 figs., table 5 refs., 11 eqs. **DLC, DWB**—A series of experiments are described in numerical forecasting in which the wind field at mid-tropospheric level is derived from a stream function, but the wind shear in the lower troposphere is computed in a variety of ways. The results show that the overestimation of the pressures in the region of anticyclones, which is inherent in models in which the mid-tropospheric wind field is assumed to be geostrophic, is significantly reduced. *Subject Headings:* **1. Numerical forecasting 2. Stream functions 3. Pressure estimates in anticyclones.** *-Authors' abstract.*

12.6–296 551.509.313:551.511

Phillips, Norman A. (*M. I. T.*), **On the problem of initial data for the primitive equations.** *Tellus*, Stockholm, 12(2):121–126, May 1960. 11 refs., 33 eqs. (Run from other source as 11C–155, March 1960, *Met. Abs.*). **DWB, DLC** –It is first demonstrated that in a forecast with the primitive equations, pure geostrophic or purely non-divergent initial wind fields will result in noticeable meteorological "noise," especially in a baroclinic atmosphere. It is then shown in a linear example that this noise is greatly suppressed if the divergence of the initial wind field is set equal to the divergence implied by the usual geostrophic theory of numerical weather prediction. The absence of noise in CHARNEY's 1955 test computation with non-divergent "balanced" initial data is explained. Finally, the quasi-geostrophic expansion is used to define initial data for a non-linear forecast with the primitive equations. Two cases are considered, that where only the geopotential is known from observations, and that where only the nondivergent part of the wind is known from observation. It is shown that the initial tendencies computed from initial data of this kind preserve the assumed geostrophic character of the flow, and thereby make it possible to get more accurate forecasts with the primitive equations. *Subject Headings:* **1. Numerical forecasting techniques 2. Meteorological noise 3. Geostrophic theories.**—*Author's abstract.*

12.6–297 551.511.2:551.513.1:551.509.313

Wiin-Nielsen, A. (*Natl. Met. Center, Suitland, Md.*), **On changes in zonal momentum in short-range numerical prediction.** *Monthly Weather Review*, Wash., D. C., 88(2):55–65, Feb. 1960. 6 figs., 13 refs., 5 eqs. **DWB, DLC**—Different factors influencing the changes in the zonally averaged wind are investigated. It is evident from recent investigations of errors in the zonally averaged winds in the non-divergent one-parameter model that the convergence of the meridional transport of zonal momentum concentrates too much momentum in the middle latitudes and predicts too small amounts of momentum in the low and high latitudes. The other factors influencing the changes of zonal momentum, i.e., mean meridional circulations, friction, and vertical transport of momentum, are investigated on an averaged basis in the following sections. In section 3 it is shown that the divergent, one-parameter model will reduce the errors in zonal momentum predicted by the nondivergent model, due to implied mean meridional circulation. The corrections to the predictions of changes in zonal momentum

caused by mean meridional circulations in a two parameter model are investigated in section 4 by the aid of operationally computed initial values of the vertical velocities. It is shown that reductions in the errors of the nondivergent model with respect to zonal momentum can be expected with a careful arrangement of the information levels in a two-parameter model. Sec. 5 contains a similar investigation of the averaged contribution of vertical advection to changes in zonal momentum. It is found that this contribution is smaller than the one resulting from mean meridional circulations, and further that the contribution from the vertical advection of momentum is not likely to reduce the errors found in the nondivergent predictions. The main conclusion from the study is that the contributions from mean meridional circulations and surface friction are the most important for the reductions of errors in the prediction of zonal momentum in the nondivergent model. Some reduction of the errors can be expected in the divergent, one-parameter model or in a two-parameter model with a proper arrangement of the information levels. In order to incorporate surface friction in a realistic way, and further in order to avoid the artificial constraint of a nondivergent level appearing in a two-parameter model, it is most likely that more than two parameters are needed for accurate forecasts of zonal momentum. *Subject Headings:* **1. Short range numerical forecasting 2. Zonal momentum 3. Mean meridional circulation.**—*Author's abstract.*

12.6–298 551.509.314:681.14:621.38

*Lönnqvist, Olov, **Statistiska 30-dagars temperaturprognoser: ett preliminärt försök för Stockholm under vintern.** [Statistical 30-day temperature prognoses: A preliminary test for Stockholm during the winter.] *Sweden. Meteorologiska och Hydrologiska Institut. Meteorologiska Byrån, Notiser och Preliminära Rapporter*, 2(3), **1959.** 14 p. 4 figs., 10 tables. **DWB**—The electronic data machine "Facit EDB" was employed in this experimental investigation, the purpose of which was to determine from January data, the statistical correlation between (1) the mean values during 5 days at the 500 mb altitude at a certain number of points in the Northern Hemisphere and (2) the mean value of departure from the normal air temperature at Stockholm Observatory in 10, 20 and 30 days. The statistical correlation was then tested for prognostic significance during a winter season and compared for dependability with similar concurrent prognoses elsewhere e.g., the 30-day U. S. Weather Bureau forecast. The results are presented in graphs and tables and apparently are most favorable. *Subject Headings:* **1. Temperature forecasting 2. Statistical forecasting.**—*W.N.*

12.6–299 551.509.314:551.524.3

Teich, M., **Fernbindungen zwischen Temperaturanomalien nach den Pentadenwerten für Potsdam.** [Distant connection between temperature anomalies according to the pentade values for Potsdam.] *Zeitschrift für Meteorologie*, Berlin, 13(9/10):224–232, Sept./Oct. **1959.** 2 figs., 3 tables, 9 refs. German, English and Russian summaries p. 224. **DWB, DLC**—The author submits a statistical evaluation of selected pentades. Prognostically applicable relations between temp. anomalies are established and discussed. *Subject Headings:* **1. Temperature anomalies 2. Temperature forecasting 3. Potsdam, Germany.**—*Author's summary.*

12.6–300 551.509.317:551.515.23

Kasahara, Akira (*Univ. Chicago*), **The numerical prediction of hurricane movement with a two-level baroclinic model.** *Journal of Meteorology*, Boston, 17(3):357–370, June **1960.** 14 figs., 4 tables, 20 refs., 7 eqs. **DWB, DLC**—A steering method pr predicting hurricane movement is formulated based upon a two-level baroclinic model. The upper steering-flow field is constructed from the pressure-weighted mean of the 200 and 500 mb steering-height fields, and the lower steering field is constructed from the pressure-weighted mean of the 700 and 1000 mb steering height fields. Here, the steering flow of a hurricane is defined as the residual field after eliminating the vortex pattern from the total-flow field. The evolutions of the upper and lower steering flows are predicted simultaneously by solving the two-level steering flow vorticity equations. Based upon these steering-flow forecasts, the movement of a hurricane is predicted with the use of an equation which is derived from a solution of two vortex vorticity equations. A side condition is imposed that the upper and lower vortex patterns should move with the same velocity in the corresponding steering flows. Ten cases of predicting the movement of hurricane "Betsy" (Aug. 1956) up to 48 hr are presented. A

preliminary comparison of the forecasts with those obtained from the barotropic model is also made. *Subject Headings:* **1. Hurricane forecasting 2. Numerical prediction of hurricane movement 3. Two-level baroclinic model 4. Hurricane "Betsy"** (Aug. 1956). —*Author's abstract.*

12.6–301 551.511.2:551.509.324.2

Jenrette, James P. (*Chanute AF Base, Illinois*), **An objective application of vorticity principles to precipitation forecasting.** *American Meteorological Society, Bulletin,* 41(6): 317–323, June 1960. 2 figs., table, 12 refs. **DWB, DLC**—An objective method is developed for forecasting the occurrence and intensity of showers. A composite moisture-stability parameter is designed which approximates the current structure of the atmosphere. This parameter is then combined with a vorticity-advection parameter which dictates the changes of the current structure. The system is designed for the summer season and is tested for Chanute Air Force Base, Illinois with a resultant skill score and per cent correct of 0.74 and 90 respectively. *Subject Headings:* **1. Vorticity principles 2. Kinematics 3. Precipitation forecasting.**—*Author's abstract.*

ARTIFICIAL PRECIPITATION (551.509.6)

See: **Chem. identification of silver iodide ice nuclei** (Koenig), 12.6–379.

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

DENSITY

See also: **Physics and med. of atmos. and space,** 12.6–7.

ATMOSPHERIC COMPOSITION (551.510.4)

See also: **Symposium on Physics, Chem. and Biol. of the Atmosphere,** 12.6–71; **Calculating the diameter of particles from turbidity** (Slonim), 12.6–257; **Apparatus for sampling the stratosphere** (Goldsmith, Parham), 12.6–271; **Scattering of saline drops near the seashore** (Kita, Aya), 12.6–363.

12.6–302 551.510.41:546.214:632.11

Rich, Saul and Taylor, Gordon S. (*both, Conn. Agri. Exper. Sta., New Haven*), **Antiozonants to protect plants from ozone damage.** *Science,* Wash., D. C., 132(3420):150–151, July 15, 1960. table, 6 refs. **DLC**—Manganous 1,2-naphthoquinone-2-oxime protected tomato foliage in the field from damage apparently caused by excessive atmospheric ozone. The compound proved to be a very effective antiozonant. The similar cobaltous and manganous chelates 8-quinolinol were also effective antiozonants. The materials were applied to cloth of the type used to make field tents for shade-grown tobacco. Tomato plants covered with cloth treated with cobaltous 8-quinolinolate were protected against otherwise damaging concentrations of ozone. These materials and methods may afford a useful way to reduce weather fleck of tobacco and other plant injuries caused by excessive atmospheric ozone. *Subject Heading:* **1. Ozone damage to plants.**—*Authors' abstract.*

ATMOSPHERIC POLLUTION (551.510.42)

See also: **Proceedings of Int. Clean Air Conf.,** 12.6–6; **Estimating gradient wind from forecast contour charts** (Lumb), 12.6–92; **Atmos. pollution by aeroallergens** (Sheldon, Hewson), 12.6–290; **Solid suspension particles in atmos.** (Pfeifer), 12.6–312; **Re-entrainment of settled dusts** (Bagnold), 12.6–362.

12.6–303 551.511.6:551.510.42

Frenkiel, François N. (*Johns Hopkins Univ.*), **Atmospheric diffusion in air-pollution studies.** *Hydraulics Conference, University of Iowa, 7th, June* 1958, *Proceedings,* pub. 1959.

p. 111–131. 17 figs., 2 eqs. **DWB** (523 H995pr)—The present paper attempts a mathe matical approach to air pollution problems, showing the applicability for this purpose numerical forecasting techniques. A mathematical model representing an urban area, L Angeles County, is presented. The general procedure adopted in constructing a model f Los Angeles County is to take into account the general meteorological and topographic conditions as well as the distribution and nature of the pollution sources, and then foreca mean concentration patterns for the mathematical model of the area. The paper is extensive illustrated by graphs and photographs. Following the paper, its subsequent discussion briefly summarized. *Subject Headings:* **1. Air pollution 2. Atmospheric diffusion.** *I.S.*

12.6–304 551.511.6:551.510.42:546.2

Gartrell, F. E.; Thomas, F. W. and Carpenter, S. B., **Transport of SO_2 in the atmosphere from a single source.** *American Geophysical Union, Geophysical Monograph*, No. 3:63–6 **1959.** 3 figs., table, 4 refs. **DWB, DLC**—A report of some preliminary findings in connectio with air pollution studies being carried out at seven large coal-fired, steam-electric pow plants, in operations and in various stages of construction under TVA. At each of the plant meteorological stations designed specifically for study requirements were installed. The ga of principal interest was SO_2 and diffusion estimates and subsequent studies were relate principally to this constituent of the stack gas. Influence of period of sampling and incrementa effects when emission is increased by adding units to a plant are discussed. Correlation c diffusion patterns with meteorological parameters and correlation of ground concentration of SO_2 with meteorological and operational data are considered. Maximum relative SO concentration one to ten units is tabulated and graphically represented. Graphical representa tions of frequency distribution of specific average concentration near a large power plant an of plume dispersion models are included. The paper also describes a full-scale diffusion-stud just being initiated. The subsequent discussion on the paper is also reported. *Subje Headings:* **1. Air pollution studies 2. Sulphur dioxide.**—*I.S.*

12.6–305 551.511.6:551.510.4

†Inoue, E. (*Natl. Inst. of Agric. Sci.*), **Studies of the diffusion phenomena in the atmospheri surface layer, Pt. 1, Diffusion of smoke from a continuous fixed source on the ground surface** *Journal of Agricultural Meteorology*, Tokyo, 15(4):123–129, March **1960.** fig., 22 refs., 41 eqs In Japanese; English summary p. 128–129. **DWB**—The diffusion phenomena of smok emitted from a continuous point source in the atmospheric surface layer are dealt with sepa rately in the vertical and in the lateral wind directions. For the lateral diffusion the Taylo method making use of Lagrangian correlation function is applied and for the vertical diffusio the Monin method making use of the relation between the vertical turbulent velocity com ponents and the mean horizontal wind velocity is applied. The diffusion width $(Y^2)^{\frac{1}{2}}$ and th diffusion height $(Z^2)^{\frac{1}{2}}$ of smoke from the ground source are calculated theoretically unde characteristic thermal conditions and the downwind distributions of maximum concentratio X_p are calculated theoretically as follows; being x the downwind distance from the source (a) Extremely unstable: $(Y^2)^{\frac{1}{2}} \sim x$, $(Z^2)^{\frac{1}{2}} \sim x^{1.5}$, $X_p \sim x^{-2.5}$; (b) Neutral: $(Y^2)^{\frac{1}{2}} \sim x$, $(Z^2)^{\frac{1}{2}} \sim x^{0.5}$ $X_p \sim x^{-1.8}$, (c) Extremely stable: $(Y^2)^{\frac{1}{2}} \sim x^{1-0.5}$, $(Z^2)^{\frac{1}{2}} \sim x^{0.5}$, $X_p \sim x^{-1.5-1.0}$. These results ar shown in good agreement with Cramer's (1957) empirical relations obtained at the Projec Prairie Grass. *Subject Headings:* **1. Diffusion of smoke 2. Vertical diffusion 3. Atmospheri pollution.**—*Author's abstract.*

12.6–306 551.511.6:551.510.42

Meade, P. J. (*Met. Office, London*), **The estimation of ground level concentration from an elevated source.** *International Journal of Air Pollution*, London, 2(4):303–308, June **1960** 2 figs., 4 refs., 11 eqs. **DWB, DLC**—Sutton's equations for calculating ground level concentra tions of gases or dusts of negligible fall speed due to an elevated source are put into a convenien nondimensional form. This is done by incorporating in the equations the maximum value o the concentration and the distance along the axis of the plume where this maximum occurs It is then shown how for each value of the stability parameter, n, a single curve gives the distribution of concentration along the axis and a single diagram gives the distribution o concentration over the whole area downwind of the source, for any values of the remaining

parameters in Sutton's equations. The use of the curve and the diagram will avoid the necessity of lengthy computations involving exponential factors and alternative values of several parameters. *Subject Headings:* **1. Sutton's equation 2. Atmospheric pollution 3. Diffusion of gases.**—*Author's abstract.*

12.6–307 551.511.6:551.510.42:551.510.522:532.52

Monin, A. S. (*Acad. of Sci., Moscow*), **On the boundary condition on the earth surface for diffusing pollution.** *Advances in Geophysics*, N. Y., Vol. 6, pub. **1959.** p. 435–436. 7 eqs. **DWB, DLC**—The diffusion of pollution along the vertical is described by the equation

$$\frac{\partial q}{\partial t} - w\frac{\partial q}{\partial z} = \frac{\partial}{\partial z}k(z)\frac{\partial q}{\partial z}$$

where q is the concentration of the pollution, t the time, w the velocity of gravitational fall of pollution particles and $k(z)$ the coefficient of vertical diffusion. The vertical pollution flux is $k(z)(\partial q/\partial t)+wq$. The solution of the above equation when there is an instantaneous point source of unit intensity at the height $z=h$ and at the moment $t=0$ under the boundary condition $(k(\partial q/\partial z)+wq-\beta q)_{z=z_0}=0$ is presented, β is constant characterizing the interaction between the diffusing pollution and the surface. An expression giving the fraction of diffusing particles to be absorbed by the earth surface at the moment t and a formula for determining β are presented. *Subject Headings:* **1. Atmospheric diffusion theories 2. Atmospheric pollution 3. Vertical diffusion.**—*I.L.D.*

12.6–308 551.511.6:551.551:551.510.42:628.53

Monin, A. S. (*Acad. of Sci., Moscow*), **Smoke propagation in the surface layer of the atmosphere.** *Advances in Geophysics*, N. Y., Vol. 6, pub. **1959.** p. 331–343. 9 figs., 9 refs., 24 eqs. **DWB, DLC** In this mathematical theoretical paper the author discusses the principle of a limited velocity of atmospheric diffusion, the use of the similarity theory for describing the turbulent diffusion in the surface layer, the shape of the boundaries of the smoke plume and concentration profiles in a smoke plume. The propagation of the pollution through space due to atmospheric diffusion occurs with a limited velocity. The turbulent diffusion in a horizontally homogeneous stationary surface layer of air obeys the similarity theory in which the values L (scale of length value) and V (scale of velocity in the surface layer) are the only scales of length and velocity. The shape of the boundaries of the smoke plume (in particular, their inclination to the horizon) does not depend upon the wind velocity, but does depend upon the stratification of the atmosphere. The concentration profiles in a smoke plume at different distances from the source are approximately similar to each other. The maximum concentration in the smoke plume is approximately inversely proportional to the distance from the source. *Subject Headings:* **1. Atmospheric diffusion theories 2. Turbulent diffusion 3. Smoke plumes 4. Smoke diffusion.**—*I.L.D.*

TROPOSPHERE—STRATOSPHERE (551.510.52/53)

See also: **Marked warmings of the stratosphere** (Behr), 12.6–28; **Influence of atmos. resistance on satellites** (Liakh), 12.6–98; **Geophys. effects associated with high-altitude explosions** (Kellogg), 12.6–208; **Nature of corpuscular radiation in the upper atmos.** (Shklovskiĭ), 12.6–209; **Optimum spacing of upper air obs.** (House), 12.6–269; **Apparatus for sampling the stratosphere** (Goldsmith, Parham), 12.6–271; **Boundary condition on the earth surface for diffusing pollution** (Monin), 12.6–307; **Turbulence aloft** (Baroni), 12.6–355; **Effects of advective temp. changes on jet stream and tropopause** (Dahler), 12.6–367.

12.6–309 551.510.52/3:551.576.1

Baranov, A. M., **O vertikal'noĭ protiazhennosti oblakov verkhnego iarusa.** [Vertical extent of high level clouds.] *Meteorologiia i Gidrologiia*, Moscow, No. 4:25–26, April **1960.** fig., 2 tables, 3 refs. **DWB, DLC**—The author presents data on the vertical extension of high level clouds over Poland and East Germany based upon reports of flight crews flying over this area during 1953–1956. Those reports in which the high level clouds constituted an independ-

ent layer were selected; these amounted to 191 instances (winter 50, spring 68, summer 3 and fall 40). The mean altitude of the upper and lower boundaries of high level clouds ove Poland and East Germany as well as over the European part of the U.S.S.R. are a maximu in summer and a minimum in winter; their mean annual thickness is 2.2 -2.3 km. Over Polan and East Germany the thickness of the upper level clouds is on the average 100–200 m greate than over the European U.S.S.R. The thickness of high level clouds may vary within consic erable limits, from several hundred meters to 4–5 km. In all seasons there is a clearly marke frequency ranging from 1.1 to 3.0 km. The frequency of such clouds is on the average 86.6% per year. In the majority of cases the clouds are observed below the tropopause and in som instances they have penetrated into the stratosphere. Above the tropopause the upper leve clouds are more rare over Poland and East Germany than over European U.S.S.R. Data o the mean altitude of the upper level clouds and their thickness and on the frequency of variou thicknesses are presented. *Subject Headings:* **1. High level clouds 2. Poland 3. Eas Germany 4. European U.S.S.R.**—*I.L.D.*

12.6–310 551.511.6:551.510.52

Ridel', E. A., **O koeffitsiente obmena v prizemnom sloe atmosfery.** [The exchang coefficient in the atmospheric layer near the ground.] *Akademiia Nauk SSSR, Izvestiia, Ser Geofiz.*, No. 4:632–634, April **1959.** 5 refs., 8 eqs. **DLC**—In an analysis of the balanc equation of turbulent energy, the author derives from

$$v_*^2 = K\frac{\partial u}{\partial z}, \qquad \frac{q}{C_p\rho} = -\alpha K\frac{\partial T}{\partial z} \qquad \text{and} \qquad D = C\frac{v_*^3}{\chi z}\left(\frac{K}{v_*\chi z}\right)^{\gamma}$$

(where $\partial u/\partial z$ and $\partial T/\partial z$ = vertical gradient of mean wind velocity and temperature, K = coeffi cient of turbulent mixing, v_* = "dynamic velocity", q = heat flow, ρ and C_p = density and heat capacity of air, T_0 = mean temperature layer, α = turbulence number of Prandtl, D = description of turbulent energy) the expression

$$\frac{L}{v_*}\frac{\partial u}{\partial z} = \frac{1}{\alpha Ri}, \qquad \frac{L}{T_*}\frac{\partial T}{\partial z} = \frac{1}{\alpha^2 Ri}, \qquad \alpha Ri = C - \frac{1}{1+\gamma}\frac{L}{\chi z}(1-\alpha Ri)\frac{1}{1+\gamma}$$

This represents a more general approximate junction for the coefficient of exchange from which the formulae of A. M. Obukhov, M. P. Budyko, etc. can be obtained. *Subject Headings:* **1. Exchange coefficient 2. Turbulent exchange 3. Turbulence near the ground.**—*I.L.D.*

12.6–311 551.510.53:551.524.732:551.557.5

Alt, J. (*Météorologie Nationale, Paris*), **Le réchauffement stratosphérique de printemps de l'atmosphère antarctique.** [The stratospheric warming of the Antarctic atmosphere in spring.] *La Météorologie*, Paris, Ser. 4, No. 57:43–63, Jan./March **1960.** 16 figs., 8 refs. French, English, Spanish and Russian summaries p. 43. **DWB**—The numerous stations installed in Antarctica for the purpose of the IGY supplied evidence of the rapid warmings which appear in spring in the stratosphere of the South Polar regions. This study deals with the austral warming in Oct.–Nov. 1958 and emphasizes particularly its dissymmetrical character and the consequences resulting thereof for the high altitude circulation. In these regions, stratospheric temperatures possess a very important annual variation. The amplitude of this variation increases with altitude, it is of 35° to 40° at about 15 km and superior to 50°C above 20 km. The author draws the attention on the dissymmetry of the temperature field in the antarctic stratosphere. The rapid warming of the stratosphere during this season commences at different times depending on the region. Beginning near the coasts of Adélie Land and Wilkes Land a little after the equinox it extends to the south and occurs only a month later in the area of the Weddell Sea. The stratospheric warming is thus not a circular phenomenon attributable only to the solar radiation after the long polar night. The stratospheric jet stream associated with this warming follows a similar pattern but it appears that it concerns only a limited part of the Antarctic. A rough comparison with the Arctic stratosphere is finally attempted. *Subject Headings:* **1. Annual stratospheric temperature variations 2. Jet stream variations 3. Stratospheric warming 4. Antarctica.**—*A.V.*

EXOSPHERE (551.510.536)

See: Symposium of Exosphere and Upper F Region, 12.6–3.

RADIOACTIVITY (551.510.7)

12.6–312 551.510.42:551.510.71

†Pfeifer, Fritz (*Karl-Marx-Univ., Inst. f. Agrarmeteorologie,Leipzig*), **Untersuchungen über die festen Schwebstoffe in der Atmosphäre und ihre natürliche Radioaktivität.** [Investigations on solid suspension particles in the atmosphere and their natural radioactivity.] *Zeitschrift für Meteorologie*, Berlin, 13(1/6):58–63, Jan./June **1959.** 20 refs. German and English summaries p. 58. **DWB, DLC**—Using the filtration method after HAXEL, in 1958 investigations were made in the southern districts of the city of Leipzig on the quantity and natural radioactivity of suspended solid particles of urban air pollution. Pollution of the city area is predominantly a function of the propagation of effluent plumes from stacks. Natural radioactivity of air-borne material is closely related to the rate of atmospheric pollution. *Subject Headings:* **1. Atmospheric pollution 2. Radioactive aerosol 3. Leipzig, East Germany.** — *Author's abstract.*

12.6–313 551.510.7(436.14)

Steinhauser, Ferdinand, **Die Aenderungen der Radioaktivität der Luft in Wien von September 1957 bis August 1959.** [Changes in atmospheric radioactivity in Vienna from September 1957 to August 1959.] *Wetter und Leben*, Vienna, 11(2/4):25–33, **1959.** 2 figs., 4 tables, 3 refs. **DLC**—The procedure for measuring atmospheric radioactivity employed in Vienna involving continuous suction of air through filter paper and measurement of the radioactivity of the filter paper by means of a Geiger counter, Mullard M×124, is described and the results of measurements carried out for the period Sept.–Aug. 1959 in Vienna are presented and analyzed. Tables and graphs showing the decade values and daily extreme values of long lived radioactivity of the air in Vienna (impulses per minute from Sept. 1 to Aug. 30, 1959), daily observation of atmospheric radioactivity on the basis of 24 hr suction ($10^{-13}\mu$ Curie/cm^3) and frequency distribution of daily observations of atmospheric radioactivity during the individual seasons from winter of 1957/1958 to summer 1959 in per centage are presented. The observed rise in radioactivity is the result of a series of atom bomb explosions. The sudden decrease in May 1959 and the more gradual return to low radioactivity values indicated that the supply of radioactive fission products in the stratosphere is exhausted much more rapidly than supposed hitherto. The observed day to day variation in radioactive fission products are chiefly the result of weather conditions and their effect upon downward air movement and horizontal transport. *Subject Headings:* **1. Atmospheric radioactivity 2. Radioactivity measurement techniques 3. Radioactivity data 4. Vienna, Austria.**—*I.L.D.*

12.6–314 551.510.721:551.578.1:551.515.83(492)

Bleichrodt, J. F.; Bleeker, W. and Schmidt, F. H., **Changes in the radioactivity regime during the passage of a cold front over the Netherlands.** *Tellus*, Stockholm, 12(2):188–194, May **1960.** 9 figs., 2 tables, 2 refs., eq. **DWB, DLC**—Artificial radioactivity in rainwater was measured during the passage of a cold front over the Netherlands. The specific radioactivity of the frontal rain increased considerably after the frontal veering of the wind. Concurrently the "age" of the fission products decreased from 45 to 17 days, indicating a supply of atom debris from recent nuclear explosions in Arctic regions. The specific radioactivity of the air increased considerably on the day of the frontal passage. Trajectories of pre-frontal and post-frontal air indicate that the pre-frontal air comes from a source region in the Mediterranean and the post-frontal air from the arctic regions. The diagram of the frontal passage is analyzed. *Subject Headings:* **1. Artificial radioactivity—weather relationships 2. Frontal passage effects on radioactivity 3. Radioactive rain 4. Netherlands.**—*Authors' abstract.*

12.6–315 551.511.6:551.510.721

Culkowski, Walter M. (*U. S. W. B., Oak Ridge, Tenn.*), **Estimates of accumulated exposures and environmental build-up of radioactivity.** "Paper presented 6th AEC Air Cleaning

Seminar, Idaho Falls, Idaho, July 7–9, 1959." 7 p. 6 figs., 7 refs., 8 eqs. **DWB** (M10.7 U587es)—A simple method for estimating long-term effluent concentration and deposit values based on Sutton's and Chamberlain's equations is presented. Calculations of co centration and deposition are straight forward, and become especially convenient if averag wind data are employed. Six figures appear at the end of the paper. Fig. 1 is a samp work sheet for effluent pattern, it lists day and night conditions. The method of computi deposition is illustrated in the deposition work sheet, Fig. 1 and in Figs. 3, 4. Figs. 5 and are representative plots of average daytime air concentrations (at surface) and average da deposition rates. *Subject Headings:* **1. Radioactive deposition calculation 2. Radioactiv in the atmosphere.**—*I.S.*

12.6–316 551.510.721(9

Dyer, A. J. and Yeo, S-A. (*both, C. S. I. R. O., Australia*), **A radio-active fallout stu at Melbourne, Australia.** *Tellus*, Stockholm, 12(2):195–199, May **1960.** fig., 3 tables, 11 re **DWB, DLC**—Measurements of the radioactive fallout occurring in weekly rainfall samples Melbourne (Aspendale) are presented for the period June 1958 to Feb. 1959. Radioacti decay analyses show the activity to have arisen from nuclear weapons tests carried out near t equator during the period April to Sept. 1958. The results indicate that despite presumabl continuous dispersion, individual radioactive clouds maintain their discreteness and a limit E-W extent even after six or nine months residence in the stratosphere. This properly allo a poleward drift speed of order 1 m/sec and zonal circulation velocities ranging from 6 to m/sec to be inferred. *Subject Headings:* **1. Radioactive fallout studies 2. Melbourne, Au tralia.**—*Authors' abstract.*

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE (551.511)

See also. **Dynamics of climate** (Pfeffer, *ed.*), 12.6–4; **Turbulent heat exchange between ice cover and air, central Arctic** (Iakovlev), 12.6–60; **Distribution of met. elements above a water surface, Lake Valdai** (Konstantinov, Federova), 12.6–229; **Successive thunderstorm days for 1901–1954, Osijek and Crikvenica** (Malovčak), 12.6–267; **Problem of dynamic met.: an intro. to numerical forecasting** (Gião), 12.6–291; **Objective map analysis using concept of circulation and vorticity** (Aubert), 12.6–292; **Numerical prediction using a stream function** (Knighting, Hinds), 12.6–295; **Problem of initial data for the primitive eqs.** (Phillips), 12.6–296; **Changes in zonal momentum in short-range numerical prediction** (Wiin-Nielsen), 12.6–297; **Application of vorticity principles to precip. forecasting** (Jenrette), 12.6–301; **Atmos. diffusion in air pollution studies** (Frenkiel), 12.6–303; **Transport of SO_2 in the atmos.** (Gartrell), 12.6–304; **Studies of diffusion phenomena** (Inoue), 12.6–305; **Estimation of ground level concentration from an elevated source** (Meade), 12.6–306; **Boundary condition on the earth surface for diffusing pollution** (Monin), 12.6–307; **Smoke propagation in surface layer of atmos.** (Monin), 12.6–308; **Exchange coefficient in atmos. layer near the ground** (Ridel'), 12.6–310; **Estimates of accumulated exposures and environmental build-up of radioactivity** (Culkowski), 12.6–315; **Use of 1000–500 mb thickness to determine freezing level** (Jefferson), 11.6–353; **Effects of advective temp. changes on formation and displacement of jet stream and tropopause** (Dahler), 12.6–367; **Dissipation of convective clouds when the atmos. is unstably stratified** (Shishkin), 12.6–382.

12.6–317 551.511:551.551.

Chiu, Wan-cheng (*New York Univ.*), **The spectra of large-scale turbulent transfer o momentum and heat.** *Journal of Meteorology*, Boston, 17(4):435–441, Aug. **1960.** 11 figs. 2 tables, 12 refs. (For abstract from another source, *see* 11.5–272, May 1960, *Met. Abs.* **DWB, DLC**—The spectra of large-scale eddy transfer of angular momentum and heat were constructed for seven levels, ranging from 700 mb to 50 mb over Belmar, N. J., and at the 300 mb and 200 mb levels over Cocoa, Florida. It is found that the frequencies of motion which were largely responsible for the eddy transport of heat shift toward lower frequencies with height. There was no such frequency shift indicated in the case of momentum transfer. The spectral intensity for the transport of angular momentum, when plotted against frequency, in general decreases with increasing frequency. The disturbances of long periods (say, longer than 20 days) were found to play a role as important as those of shorter periods in contributing

to the total eddy transport of both heat and momentum. *Subject Headings:* **1. Turbulence spectra 2. Upper atmosphere turbulence 3. Turbulent transfer 4. Large scale turbulence.**—*Author's abstract.*

12.6–318 551.511:532.5:608.5

Davies, T. V. (*King's College, London*), **The forced flow of a rotating viscous liquid which is heated from below.** *Royal Society of London, Philosophical Transactions, Sec. A*, 246:81 112, **1953.** 5 figs., 2 refs., eqs. **DLC.** Reprinted in Saltzman, Barry, (*ed.*), **General Circulation as a problem in thermal convection.** (MIT, Dept. of Meteorology, Contract AF 19(604)-2242, Scientific Report, No. 1, March **1958.** p. 241–272.)—A liquid is contained in a cylindrical vessel and is subject to heating on the horizontal base of the vessel. The problem of the forced flow arising from the heating has been investigated in the case when the heating function is symmetrically arranged about the central axis. It is found that the relative forced flow tends to become zonal in character when the vessel rotates at a sufficiently high angular velocity. This relative zonal motion is principally in the direction of the rotation except near the outer portion of the fluid where it is in the opposite direction, the former being 'westerlies,' the latter 'easterlies.' The easterlies are due to the non-linear inertia terms in the equations of motion. This description of the velocity field is used because the experiment described above has considerable meteorological significance. *Subject Headings:* **1. Thermal convection 2. Zonal circulation 3. Equations of motion 4. Thermal convection-meteorological relationships.**—*Author's abstract.*

12.6–319 551.511:631.67:551.510.522

†de Vries, D. A., **The influence of irrigation on the energy balance and the climate near the ground.** *Journal of Meteorology*, Boston, 16(3):256 270, June **1959.** 5 figs., 2 tables, 30 refs., 36+36 eqs. **DWB, DLC**—A theoretical analysis is presented of the influence of irrigation on temperature, humidity of the lower air layers and on the energy balance of the surface. Starting from meteorological data for the dry land (averaged over periods of a few days or longer), the average temperature and moisture profiles in an irrigated area are calculated as functions of the distance downwind from its boundary. The principal simplifying assumption in the analysis is that for each height the eddy diffusivities should have the same values in the irrigated and nonirrigated areas. The theory is applied to and illustrated by measurements of climatic differences between irrigated and nonirrigated pastures in the Australian Riverina. Experimental results of other investigators are briefly discussed. The present developments have led to a theoretical estimate, taking advective energy into account, of the potential evaporation rate for irrigated areas of limited extent on the basis of standard meteorological data for the dry land. The influence of advection decreases rapidly with increasing distance downwind. Under summer conditions in the Australian Riverina, it is considerable up to distances of about 1 km. *Subject Headings:* **1. Irrigation effects 2. Energy balance 3. Temperature profiles 4. Humidity profiles 5. Riverina, New South Wales.**—*Author's abstract.*

12.6–320 551.511

†Hofmann, Gustav, **Wärmehaushalt und Advektion.** [Thermal economy and advection.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, Vienna, 11(4):474–502, **1960.** 27 refs., 56 eqs. German, English and French summaries p. 474–475. **DLC**—The statement that no advective terms occur in the energy balance of a horizontal surface seems at first sight to be in contradiction to the quotation of advective terms in some publications. It proves, however, that in that case it is a question of energy balance of a volume, where for comparability the terms are related to the ground surface, or that it is due to errors of measurement or consideration. Advective heat fluxes are merely of importance with three-dimensional problems. The study of the energy balance of a solid volume shows that the heat flux from the air to the ground is generally not equal to the vertical exchange heat flux above the ground surface, even with stationary conditions. Four further heat fluxes supervene which may be designated as passing heat flux, vertical convection heat flux, advective convection heat flux and advective exchange heat flux. Their share of heat flux from the air to the ground depends not only on the meteorological conditions but also on the altitude of the reference surface for

which the exchange heat flux is determined. Its estimation by simple, plausible assumptio shows that in general they should not be neglected. A sufficient condition for their disappea ance is the assumption that all parameters at the same level have the same temporal me value. The energy balance can be set up also for unstationary conditions and for the he transport in an inhomogeneous medium. In the case where the mass of admixtures contain in the volume undergoes changes the energy balance cannot be established without arbitra assumptions. *Subject Headings:* **1. Advection theories 2. Energy balance 3. Heat flow.** *Author's abstract.*

12.6–321 551.5

Hofmann, Gustav, **Wärmestrom, Massenstrom und Volumstrom.** [Heat flux, ma flux, and volume flux.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser.* Vienna, 11(4):465–473, **1960.** 6 refs., 31 eqs. German, English and French summaries p. 46 **DLC**—Proceeding from the equation of a heat flux $L = mi$ carried along by a mass flux $m = \rho$ it is shown that the heat flux can only be given without arbitrary assumptions, if the mass fl disappears in the mean, since the specific enthalpy i is determined only up to a constan Also for a balanced mass flux $m = 0$ there exists an average wind velocity v normal to the surfa of reference, which is proportional to the mean heat exchange flux, whereby for air $v/L = 2$ m $\sec^{-1}$/cal cm^{-2} min^{-1}. *Subject Headings:* **1. Thermodynamics of the atmosphere 2. He exchange 3. Heat flow.**—*Author's abstract.*

12.6–322 551.511:551.5

Hollmann, G. (*Offenbach am Main*), **Über die Nullschichteigenschaft von Flächen e tremer Windstärke.** [The zero layer property of surfaces of extreme wind intensity.] *M teorologische Rundschau*, Berlin, 12(6):170–173, Nov./Dec. **1959.** fig., 9 refs., 25 eqs. Germa summary p. 170. **DWB, DLC**—On the assumption that the characteristics of the zero lay is a surface of extreme wind velocity not penetrated by mass, i.e., the zero layer behaves lik a material boundary surface, the author attempts to determine the conditions under which surface of extreme wind velocity possesses the zero layer characteristic. By introducing a su face of extreme wind intensity as the coordinate surface and equation for the velocity of penetra tion (rate of vertical motion) of such surfaces is derived from the hydrodynamic equations o motion. From this equation there are obtained three conditions (zero layer conditions) for th disappearance of generalized motion upon this surface. The following magnitudes must man fest extremes with reference to the vertical ordinate so that surfaces of extreme wind velocit possess the zero layer characteristics: (1) the components of the gradient force in the directio of the stream line (wind components practically perpendicular to the isobars), wind directio and the friction components in the direction of the stream line. These three components an the possibility of mass flow from the troposphere into the stratosphere and vice versa ar discussed. *Subject Headings:* **1. Zero layer 2. Upper air winds.**—*Transl. of author's abstra (I.L.D.).*

12.6–323 551.501.5:551.511:551.521:551.57

Lowry, William P. (*Oregon Forest Lands Res. Center, Oreg.*), **Graphical presentation o energy-budget measurements.** *Journal of Meteorology*, Boston, 16(1):80–83, Feb. **1959** 2 figs., table, 7 refs., 2 eqs. **DWB, DLC**—The author develops a graphical presentation of th energy budget components enabling rapid and meaningful computation of several sets of data at a glance. In a diagram representing 20 sets of energy-budget data the energy budget is given by $R_m = E + B + L$ where R_m = net amount of energy of all wave lengths arriving at th earth's surface, E = net amount of energy used at the surface in evaporation, condensation freezing and melting; B = net amount of energy transferred from the surface to the soil and L = net amount of energy released by the surface to the atmosphere by advection minus the net amount of energy advected to the system. The ratio E/L and E/B can be used to study the relative values of all the components. The ordinates are values of E/C and the abscissas are values of E/B. Diagrams of the energy budget based on data on the 20 systems and of the energy budget at O'Neill, Nebr. for Aug.–Sept. 7, 1953 are presented. The energy budget o O'Neill is analyzed. *Subject Headings:* **1. Energy budget 2. O'Neill, Nebr.**—*I.L.D.*

12.6–324 551.511.12

Van Mieghem, Jacques, **Le principe variationnel de la mécanique de l'atmosphère.** [Principle of variation in the mechanics of the atmosphere.] *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 32(3/4):135–152, **1960.** 10 refs., 12 eqs. German, French and English summaries p. 135. **DWB, DLC** –The air trajectories with respect to the earth are the curves of the space occupied by the atmosphere which gives extreme values of the fourfold integral (5.2) under the condition that the differential form (5.1) is kept invariant. This condition allows for the continuity of the atmosphere and the changes of state which the moving air undergoes. The law of these changes is expressed by the invariance of a parameter θ. The air is assumed to be an ideal compressible fluid but the extremum principle may also be applied to an incompressible fluid. Furthermore, this principle is also applicable to the case of hydrostatic equilibrium of an ideal fluid in the gravity fluid. In this case, the second derivative of the integral (10.3) leads to the stability criterion of hydrostatic equilibrium. *Subject Headings:* **1. Mechanics of the atmosphere 2. Hydrostatic equilibrium.**—*Author's abstract.*

12.6–325 551.511.2:551.513.1:551.509.318:551.515

Fleagle, Robert G. (*Univ. Washington*), **Some estimates of the effects of heating on large scale disturbances.** *Tellus*, Stockholm, 12(2):127–133, May **1960.** fig., 9 refs., 21 eqs. **DWB, DLC**—Effects of heating on large scale disturbances are studied by assuming that heating is tuned to the disturbances, with rate of heating proportional to individual pressure change but displaced by an arbitrary phase angle. The linearized two-layer baroclinic model reveals that the heating which accompanies condensation in the middle troposphere may lead to marked increase in instability and to shift of maximum instability from five to three thousand kilometer wave lengths, and this calls attention to a serious defect in the two-layer model which must influence the accuracy of numerical calculations using the nonlinear equations. *Subject Headings:* **1. Kinematics 2. Baroclinic models 3. Numerical forecasting 4. Large scale disturbances.**—*Author's abstract.*

12.6–326 551.511.2:551.513.1

Tucker, G. B. (*Met. Office, London*), **The atmospheric budget of angular momentum.** *Tellus*, Stockholm, 12(2):134–144, May **1960.** 8 figs., 6 tables, 19 refs., 10 eqs. **DWB, DLC**—The mean meridional circulation derived from wind observations is combined with surface torque and mountain torque measurements to obtain a complete angular momentum budget for the Northern Hemisphere between 15°N and 70°N for summer and winter. A previously proposed scheme of vertical flux of angular momentum involving downward flux everywhere except in the lower layers of the tropical easterlies is confirmed. The layer of zero vertical flux in the tropics is approximately at the level of maximum easterly wind. *Subject Headings:* **1. Kinematics 2. Angular momentum budget 3. Northern Hemisphere.**—*Author's abstract.*

12.6–327 532.5 551.511.32:551.515.1/2

†Bryan, Kirk (*Woods Hole Oceanog. Inst.*), **The instability of a two-layered system enclosed between horizontal, coaxially rotating plates.** *Journal of Meteorology*, Boston, 17(4):446–455, Aug. **1960.** 5 figs., table, 14 refs., 25 eqs. **DWB, DLC**—The motion of two homogeneous layers of fluid enclosed between horizontal plates, which rotate coaxially at slightly different angular velocities, has been investigated. The solution for the zonally symmetric forced motion is only a slight modification of a solution of STEWARTSON'S (1953) for a single fluid between rotating disks. Experiments with the two-layer system confirmed the existence of symmetric motion, but for a certain range of parameters it was unstable. A criterion for instability of the symmetric flow was developed from comparison with experiment indicated stability for somewhat greater shear across the interface of the two layers than predicted. Exploratory experiments in the unstable range demonstrated that the number of disturbances tended to increase directly as the rotation rate and inversely with the density difference. A steady wave pattern was observed only when the horizontal dimensions of the disturbance were comparable to the diameter of the cylindrical container. The shape of the steady disturbance was such as to give a strong transport of momentum inward. Certain analogies are drawn between eddy circulation observed in the experiments and low-level cyclones in the

atmosphere and meanders of upper-level ocean currents. *Subject Headings:* **1. Eddy circulati 2. Low level cyclones 3. Ocean current meanders.**—*Author's abstract.*

12.6–328 551.511.32:551.513

Green, J. S. A. (*Imperial College, London*), **A problem in baroclinic stability.** *Roy Meteorological Society, Quarterly Journal*, 86(368):237–251, April **1960.** 11 figs., table, 3 refs 13 eqs. **DWB, DLC**—Linearized equations are used to formulate the theoretical problem of t stability of large-scale zonal flow with vertical shear. The problem is solved to some ge erality and illustrates the connection between the solutions already obtained by Rossb Charney and Eady. *Subject Heading:* **1. Baroclinic stability.**—*Author's abstract.*

12.6–329 551.511.32:551.558.21:523.5

Sawyer, J. S. (*Met. Office, Dunstable*), **Numerical calculation of the displacements of stratified airstream crossing a ridge of small height.** *Royal Meteorological Society, Quarter Journal*, 86(369):326–345, July **1960.** 11 figs., 16 refs., 26 eqs. **DWB, DLC**—Numeric computations have been made of the solutions of the equation

$$\frac{\partial^2\psi}{\partial x^2}+\frac{\partial^2\psi}{\partial x^2}+l^2\psi=0$$

which describes the stream lines in two-dimensional flow of small amplitude in a stratifi airstream. Solutions are computed for various variations of the parameter l as a function height ($l^2=g\beta/U^2-U^{-1}\partial^2U/\partial z^2$ is function of the wind and temperature variations with heig in the airstream). To render the mathematical problem determinate the value of l^2 is assume to be constant above 16 km up to unlimited heights and by specifying the form of solutio above 16 km consistent solutions are obtained for the troposphere little affected by the valu of l^2 assumed at high levels. The solutions include lee-wave trains which diminish in amplitud downstream as well as those of constant amplitude. The method of solution results in th former appearing on the downstream side of the ridge only. (It is assumed that waves o constant amplitude can appear only on the downstream side.) Some typical displacement of the stream lines are illustrated in Figs. 3 to 10. They are similar to those computed b Queney (1947) and Scorer (1949) but it is demonstrated that lee waves may arise fro variations of l^2 with height additional to those specified by these authors. *Subject Headings* **1. Equations of motion 2. Orographic influences.**—*Author's abstract.*

12.6–330 551.511.6:551.515.11:551.513.1

Kao, S.-K. (*Univ. California, L. A.*), **Transfer of momentum vorticity and the maintenance of zonal circulation in the atmosphere.** *Journal of Meteorology*, Boston, 17(2):122–129, Apri **1960.** 2 figs., 18 refs., 25 eqs. **DWB, DLC**—The properties of the volume integral of momen tum vorticity are examined. These results are applied to the study of the maintenance o zonal circulation of a polar cap. It is shown that the rate of change of the vertical component of relative momentum vorticity is mainly due to (1) the effect of the convergence of meridional flux of angular momentum and its lateral boundary surface, (2) the frictional force at the earth's surface, and (3) the action of the mountains on the atmosphere. A model for the mean state of the atmosphere in the Northern Hemisphere, based on the distribution of the mean surface zonal wind, is studied and the maintenance of the zonal circulation is discussed on the basis of the meridional transports of both angular momentum and momentum vorticity. It is shown that in the middle latitudes the meridional transfer of momentum vorticity is directed toward the north pole, whereas in the lower latitudes, as well as in the polar region, the transport is directed toward the equator. These results agree with the mean meridional transport of momentum vorticity in the month of January 1949, computed from the geostrophic winds. *Subject Headings:* **1. Vorticity 2. Circulation in the Atmosphere 3. Zonal circulation.**—*Author's abstract.*

12.6–331 551.511.6:551.551.8:551.554

Panofsky, H. A.; Blackadar, A. K. and McVehil, G. E. (*all, Penn. State Univ.*), **The diabatic wind profile.** *Royal Meteorological Society, Quarterly Journal*, 86(369):390–398,

July 1960. 5 figs., table, 15 refs., 12 eqs. **DWB, DLC**—Wind profiles observed at various locations are compared with wind profiles predicted by ELLISON on the basis of similarity theory. It is shown that theory and observations agree well for near-neutral and unstable air; however, in stable air, factors not considered in the similarity theory may become important. The range of usefulness of the log-linear wind profile is shown to be small. *Subject Headings:* **1. Diabatic wind profiles 2. Similarity concepts.**—*Authors' abstract.*

GENERAL CIRCULATION (551.513)

See also: **Dynamics of climate** (Pfeffer, *ed.*), 12.6–4; **Changes in level of Atlantic Ocean and their relation to atmos. circulation** (Butorin), 12.6–21; **Objective map analysis using concept of circulation and vorticity** (Aubert), 12.6–292; **Changes in zonal momentum in short-range numerical forecasting** (Wiin-Nielsen), 12.6–297; **Effects of heating on large scale disturbances** (Fleagle), 12.6–325; **Atmos. budget of angular momentum** (Tucker), 12.6–326; **Problem in baroclinic stability** (Green), 12.6–328; **Transfer of momentum vorticity** (Kao), 12.6–330; **Change in climatic elements, Vologda Region** (Antipov), 12.6–421; **Changes in atmos. circulation** (Ped', Sidochenko), 12.6 440.

12.6–332 551.513(98):551.509.318/4,571)

*Rafailova, Kh. Kh., **Vliianie Arktiki na osobennosti meridional'noĭ tsirkuliatsii nad Evropoĭ i Zapadnoĭ Sibir'iu.** [Effect of the Arctic on the peculiarities of meridional circulation over Europe and western Siberia.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, No. 49:181–230, **1957.** 22 figs., 11 tables, 17 refs. **DLC**—In this detailed study, the author examines the effect of any circulation type over the Arctic upon the characteristics of the meridional circulation in temperate latitudes of Europe and Western Siberia, and attempts to establish forecasting criteria which would utilize this relationship to forecast weather for a natural synoptic period. With the aid of synoptic maps and numerical data there is presented a discussion of the circulation conditions over the Arctic during monotypic meridional processes over Europe and western Siberia; the effect of the thermal conditions of the lower half of the troposphere over the Arctic, during meridional processes, upon anticyclogenesis in the frontal zone in the eastern periphery of a ridge aloft; and the effect of circulation and thermal conditions of air masses of a preceding synoptic period over the Arctic upon synoptic processes and type of weather over European U.S.S.R. and western Siberia. Ten forecast criteria are developed and their application to forecasting weather for natural synoptic periods is illustrated. For long range forecasts of weather of short duration the processes of the natural synoptic region alone do not suffice. In cases of meridional processes it is necessary to consider also processes of the Arctic Basin. In monotypic meridional processes over Europe and western Siberia four characteristic types of thermal pressure field may be observed over the Arctic. The nature of the pressure field and the thermal condition of atmospheric processes over the Arctic during analogous meridional circulation in middle latitudes adequately characterize the synoptic process and the particular weather at the earth's surface in the region of high frontal zone of a meridionally oriented ridge aloft. *Subject Headings:* **1. Meridional circulation 2. Forecast criteria 3. Forecasting for natural synoptic periods 4. Synoptic charts 5. Numerical data 6. Europe 7. Western Siberia.**—*I.L.D.*

12.6–333 551.513

Sutton, Sir Oliver Graham (*Met. Office, Great Britain*), **Theories of the circulation of the earth's atmosphere.** *Observatory*, London, 80(918):169–190, Oct. **1960. DLC** (QB1.02)—A connected account is given of the historical development of ideas related to the circulation. The account begins with descriptions of Halley's idealized pattern and of Hadley's cell. The paper then goes on to discuss the observed characteristics of the general circulation and the mean zonal motions. The relationship between the upper westerlies and the fall of temperature from the equator to the poles is discussed. This is followed by an account of theories based on the transfer of angular momentum, the Rossby and Palmén meridional circulation models and the concept of a baroclinic atmosphere with particular reference to the work of SHEPPARD and FLEAGLE. A shorter discussion is given of the stratospheric circulation based, in the main, on the Dobson-Brewer circulation model. *Subject Headings:* **1. General circulation**

theories 2. Atmospheric circulation 3. Zonal circulation 4. Stratospheric circulatio 5. Circulation models.—*R.B.*

12.6–334 551.513.

*Mashkovich, S. A., **O formitovanii zonal'noĭ tsirkuliatsii.** [The formation of zona circulation.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, 78:5–36, **1958.** 20 figs 6 tables, 8 refs., 45 eqs. **DWB**—The origin and maintenance of the heat of the zonal circulatio under the influence of advection of solar heat for given values of albedo of the earth's surfac are investigated. The problem of constructing zonal fields of temperature, pressure and win involves the solution of equations

$$\rho c_p \frac{\partial T}{\partial t} = \frac{\partial}{\partial z}\left(\lambda' \frac{\partial T}{\partial z}\right) + \frac{\lambda''}{r_0^2 \sin\theta} \frac{\partial}{\partial \theta}\left(\sin\theta \frac{\partial T}{\partial \theta}\right) + \alpha_2 \rho_w (A + B + \beta S - 2E);$$

$$2\omega \cos\theta_{z\lambda} = \frac{1}{r_0 \rho} \frac{\partial \rho}{\partial \theta}; \qquad \frac{\partial \rho}{\partial z} = -g\rho;$$

$$\frac{\partial A}{\partial z} - \alpha_2 \rho_w (A - E); \qquad \frac{\partial B}{\partial z} = \alpha_2 \rho_w (E - B);$$

$$\frac{\partial S}{\partial z} = \rho_w \alpha_2 \beta S; \qquad \text{and} \qquad C^* \rho^* \frac{\partial T^*}{\partial t} = \lambda^* \frac{\partial^2 T^*}{\partial z^2}$$

for eight limiting conditions and given initial conditions. The solution of the equations was carried out for three variants of the problem, namely: (1) determination of the mean annual distribution of temperature, pressure and wind; (2) determination of the annual variation of zonal temperature and wind velocity and (3) for any initial distribution of the meteorological elements for any kind of temporal variation of heat advection. The solution of the equations of heat advection and transport of radiant energy, the computation method for calculations on an electronic computer and the results of calculations are presented. Data on the distribution of mean annual zonal values of albedo distribution of zonal temperature and of zonal gradient wind, ratio of temperature at different times to initial temperature at the same level, etc. are presented in tables and graphs. *Subject Headings:* **1. Zonal circulation 2. Zonal temperature fields.**—*I.L.D.*

12.6–335 551.513.2:551.557.5:551.515.827(5–012)

*†Mohri, K. (*Japan Met. Agency, Tokyo*), **Jet streams and upper fronts in the general circulation and their characteristics over the Far East, Pt. 2.** *Geophysical Magazine*, Tokyo, 29(3):333–412, Aug. **1959.** fig., tables, 58 refs., eqs. English summary p. 333. **DWB, DLC**—In Pt. I, the author has described and discussed the following characteristics of jet streams and upper fronts: Ch. 1. Synoptic aspects of jet streams and associated thermal field in the general circulation; Ch. 2. Dynamic and kinematic aspects of jet streams and high level frontogenesis; Ch. 3. Characteristics of mean jet streams and associated thermal field over the Far East. In Pt. II, in continuation of Pt. I, the author has tried to discuss the effect of the Himalayas and the Tibetan Plateau upon jet streams, and to describe the behavior and the vertical structure of individual jets and upper fronts. In other words, in Ch. 4, a stationary flow pattern at 250 mb level during winter is computed using the two-layer model. The current which encircles Himalayas and the Tibetan Plateau is taken into consideration. The result shows that a northern jet and a southern jet round the mountains comes into confluence over Japan and its vicinity, forming a strong jet whose intensity is in fairly good coincidence with the observation. In Ch. 5, aerological analysis of the process of jetogenesis and upper frontogenesis during the first ten days of Oct. 1957 is presented. This analysis clearly shows a typical example of the formation of the subtropical jet and subtropical upper front over the Far East. Secondly, analysis of the three dimensional structure of the subtropical jet stream on 3 Nov. 1952 is presented. These analyses show the generality and validity of the author's consideration and discussions presented in the Pt. I. Lastly in Ch. 6, a general conclusion for the Pt. I and Pt. II is presented. *Subject Headings:* **1. General circula-**

tion 2. Atmospheric circulation 3. Jet stream analysis 4. Upper air fronts 5. Frontogenesis 6. Himalayas 7. Tibetan Plateau 8. Far East.—*Author's abstract.*

12.6–336 551.513.3:551.515.727

Boville, B. W. (*McGill Univ.*), **The Aleutian stratospheric anticyclone.** *Journal of Meteorology*, Boston, 17(33):329–336, June 1960. 13 figs., 11 refs. **DWB, DLC**—The dominant feature of the 1958–59 polar-night circulation was the intense warm anticyclone which developed over the Aleutian-Alaskan area in Oct. The anticyclone persisted throughout the winter acting as an anchor ridge for the strong baroclinic waves in the polar-night stream. The character of the middle stratospheric domain and some features of the baroclinic waves are presented. The Oct. anticyclogenesis which occurred with only moderate stratospheric baroclinity is related to tropospheric cyclogenesis by synoptic techniques and Fourier analysis. *Subject Headings:* 1. Stratospheric anticyclones 2. Polar-night circulation 3. Baroclinic waves 4. Anticyclogenesis 5. Aleutian Islands 6. Alaska.—*Author's abstract.*

ATMOSPHERIC DISTURBANCES (551.515)

See: **Analyses of Fargo tornadoes, June 1957** (Fujita), 12.6–31; **Microseisms** (Gynkina, Masarakiĭ), 12.6–221; **Numerical prediction of hurricane movement** (Kasahara), 12.6–300; **Radioactivity regime during passage of a cold front, Netherlands** (Bleichrodt), 12.6–314; **Effects of heating on large scale disturbances** (Fleagle), 12.6–325; **Instability of a two layered system** (Bryan), 12.6 327; **Transfer of momentum vorticity** (Kao), 12.6–330; **Jet streams and upper fronts, Far East** (Mohri), 12.6–335; **Aleutian stratospheric anticyclone** (Boville), 12.6–336; **Determination of lower boundary of stratus clouds in an air mass** (Bogdanova, Shvets), 12.6–387; **Synoptic conditions for intense precip., Stanislav Region** (Raevskii), 12.6–395; **Star scintillations as a means for investigating atmos. disturbances** (Fürth), 12.6–444.

RADIATION AND TEMPERATURE

RADIATION (551.521)

See also: **Sec. D1,** p. 1123; **Sec. D3,** p. 1127; **Sec. D5,** p. 1132; **Ultraviolet radiation and its hygienic characteristics, Murmansk** (Kaĭkov), 12.6 121; **Radiation balance of water reservoirs** (Timofeev), 12.6–227; **Calculating the diameter of particles from turbidity** (Slonim), 12.6–257; **Global radiation, Delhi** (McGreevy), 12.6–265; **Intensity of Na lines in the emission of sodium ejected from rockets** (Vassy, Vassy), 12.6–279; **Measurements of infrared radiation** (Bushnell), 12.6–281; **Solar variability and paleoclimatic changes** (Öpik), 12.6–422.

12.6–337 551.521.1:551.506.22(569.4)

*Ashbel, D., **Solar radiation and sunshine in Jerusalem $\varphi = 31°46'$, $\lambda = 35°15'$, $h = 782$ m.** Jerusalem, Israel, Hebrew University, Department of Climatology and Meteorology, 1959. 32 p. almost entirely tables. At head of title page: International Geophysical Year, 1957–58. —Solar radiation and day-light observations were taken at the Hebrew University Department of Climatology and Meteorology in Jerusalem ($\varphi = 31°46'$, $\lambda = 35°15'$, $h = 782$ m) during the IGY (1957/58), with several instruments. Solar global radiation was recorded by an Epply pyrheliometer attached to a Speedomax Recorder-Integrator of Leeds and Northrup. Diffuse sky radiation was also recorded by an Epply pyrheliometer attached to a Micromax Recorder-Integrator. Normal incidence radiation was taken hourly with a Linke-Feussner actinometer of Kipp and Sons provided with filters, PG1, RG2, for subdivision of the solar spectrum. Normal incidence radiation was also recorded automatically by a Moll-Gorczyńsky pyrheliograph made by J. Richard, Paris. Duration of sunshine was recorded on a weekly chart by a Robitzsch Pyranograph, made by R. Fuess, Berlin. Daylight measurements were taken with Lange's selenphotometer S60 covered with an Opal-Platinum filter (1/100 or 1/150) and calibrated frequently with a Weston photometer, Model 758, made in Newark, U. S. Daylight was also continually recorded and integrated by Lange's selenphotometer light-integrator. Daylight measurements on 8 major walls and in rooms with variously oriented windows of different sizes were also taken hourly during the IGY. Observations with a spherical py-

ranometer, improved by the Davos Physical-Meteorological Observatory from the Bellany-Henry lucimeter, were taken hourly in Jerusalem. Net exchange measurements were taken in Jerusalem with a thermal-radiometer manufactured by Beckman and Whitely of San Carlos, Calif. *Subject Headings:* **1. Solar radiation measurements 2. Sunshine duration measurements 3. IGY radiation program 4. Jerusalem, Israel.**—*Author's abstract.*

12.6–338 551.521.1

Bernhardt, Fritz, **Berechnungen der Globalstrahlung nach Budyko, Black und Bernhardt/Phillipps.** [Global radiation calculation according to Budyko, Black and Bernhardt/Phillipps.] *Zeitschrift für Meteorologie*, Berlin, 12(8):225–230, Aug. **1958.** 5 figs., table, 4 refs., 5 eqs. **DWB, DLC**—Budyko's calculations (pub. 1955) and Black's calculations (1956) conclude the global radiation all over the world for each month of the year. They employed empirically derived formulas whereas BERNHARDT/PHILLIPPS in their work (1958) largely employed theoretical formulas. The object of this paper is to demonstrate the results arrived at by comparing the works with one another, which is discussed in some detail. The zonal distribution of the global radiation shows a very good agreement which is shown in curves. Tabulated values in kcal cm^{-2} $year^{-1}$ were existant for BUDYKO and BLACK respectively, hence author computed these values from BERNHARDT/PHILLIPPS results and the table for comparison show the good agreement. *Subject Headings:* **1. Global radiation calculation 2. Radiation data for world.**—*Author's abstract.*

12.6–339 551.521.1:551.509.318

Leistner, Walter, **Jahresverlauf der Globalstrahlung sowie der Relativwerte für Wyk auf Föhr und die Beziehung dieser zu meteorologischen Elementen und Tageswettertypen.** [Annual variations of global radiation and of the relative values for Wyk auf Föhr and their relation to meteorological elements and daily weather types.] *Zeitschrift für Meteorologie*, Berlin, 11(12):353–367, Dec. **1957.** 10 figs., 3 tables, 5 refs. **DWB, DLC**—This comprehensive study of the characteristics of relative radiation (percent global radiation of ideal radiation is determined from astronomical data and a Rayleigh atmosphere) contains the following: description of instrumentation; annual variation of global radiation and of cloudiness; relationship of relative radiation values to atmospheric vapor pressure at the surface and to cloudiness; frequency distribution of relative values of global radiation; the relationship between relative sunshine duration and relative global radiation; and the relation between daily weather types and relative global radiation. Extensive numerical data are presented in tables and in graphs. *Subject Headings:* **1. Global radiation data 2. Weather effects on radiation 3. Wyk auf Föhr, Germany.**—*I.L.D.*

12.6–340 551.521.11(41/42)

Hancock, D. S. (*The Roundels, Cranbrook, Kent*), **An analysis of sunshine values in the British Isles for the period 1909–1958.** *Royal Meteorological Society Quarterly Journal*, 85(366):432–434, Oct. **1959.** 5 tables, 2 refs. **DWB, DLC**—A tabulation of sunshine values on the basis of data obtained from investigations into bright sunshine in the British Isles for 1909–1958, now covering a period of 50 years. In all, five tables are presented. The first four tables present 1949–1958 bright sunshine values as a percentage of the 1909–1933 mean, separately for England and Wales, Scotland, Ireland, and as a whole for British Isles. Table 5 shows the years 1909–1958 arranged according to the yearly sunshine values for the British Isles as a whole. *Subject Headings:* **1. Sunshine tables 2. British Isles.**—*I.S.*

12.6–341 551.521.14:551.578.46

Kuznetsov, M. A., **Glavnaia prichina zakonomernogo umen'sheniia al'bedo taiushchego snezhnogo pokrova.** [The main cause for the regular decrease in the albedo of a melting snow cover.] *Problemy Arktiki i Antarktiki*, Leningrad, No. 3:112–115, **1960.** 2 figs., 2 tables, 2 eqs. **DWB**—The study of radiation from the snow cover by various investigators are reviewed in connection with the seasonal and annual variations of the albedo of thawing snow in the Northern Hemisphere and Antarctic. Attention is given to various stages of the thawing process and to the causes for changes in the intensity of the albedo. The reflected radiation from snow cover is visually connected to various factors such as contamination by dust,

wetting, deposition of fresh snow, freezing, formation of dense layer under action of wind, sun or moisture in air. The next group of factors are related to over crystallization, neve formation, distillation, sublimation, freezing and thawing. All these processes and causes for decreasing albedo are described in the published work of P. P. KUZ'MIN, **Physical properties of snow cover,** (1957). The author of this article reviewed and commented on the above work in detail and other earlier works. *Subject Headings:* **1. Albedo variations 2. Radiation of snow cover 3. Albedo of snow.**—*N.P.S.*

12.6–342 551.521.2/3:551.576.1

Lopukhin, E. A., **Radiatsionnoe nagrevanie ili okhlazhdenie vozdukha vblizi poverkhnosti oblakov.** [Radiational warming or cooling of air near the surface of clouds.] *Sredneaziatskiĭ Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy,* No. 2(17):99–138, **1959.** 4 figs., 24 tables, 4 refs. **DWB** (M(055) U581ts)—The values of heat flow in the free atmosphere in the case of the presence of cloud cover of at least 5 octas was studied by means of data collected during 46 airplane flights. The aircraft was provided with 2 effective pyranometers, one in the top and the other on the bottom of the aircraft. The heat current produced by the difference between radiation flux in the free atmosphere and by radiation from the black plate of the effective pyranometer was computed by a microammeter. The effect of wind velocity, thermal conductivity, atmospheric density and temperature upon the registrations of the apparatus were computed. The paper contains the following data in the form of tables: descriptions of the airplane flights including information on cloud cover as observed from the earth, characteristics of flight etc.; magnitudes of downward radiation flux of the counter radiations of the atmosphere at different levels in the free atmosphere; upward radiation flux at different levels in the free atmosphere; upward and downward radiation fluxes observed at different levels in the free atmosphere in 1957; effective radiation in the atmosphere over the Tashkent aerodrome and the Tashkent Geophysical Observatory; warming or cooling of the atmosphere at different levels in the atmosphere for *Ns* cloudiness and other types of cloudiness; long wave effective radiation of the black surface for air temperature at a height of 2 km, atmospheric radiation in Tashkent etc. *Subject Headings:* **1. Radiational cooling 2. Cloud effects on radiation.**—*I.L.D.*

12.6–343 551.521.3:551.571

*McDonald, James E. (*Univ. Arizona*), **Direct absorption of solar radiation by atmospheric water vapor.** *Journal of Meteorology,* Boston, 17(3):319–328, June **1960.** 3 figs., 4 tables, 15 refs., 4 eqs. **DWB, DLC**—A review of Fowle's solar-absorption studies reveals that no pressure correction must be applied to the familiar Fowle band-absorptivity curves since these were obtained by methods that automatically corrected them to sea-level pressure. Using these absorptivities, along with recent solar-energy-distribution data, total insolational absorptivities are obtained. These are fitted (with relative accuracy of about 1% over the range 0.3 to 8.0, precipitable water) to an exponential function similar to that used by MÜGGE and MOLLER to obtain working relations for use in calculating daily heating amounts due to insolational absorption by water vapor. It is found that variation of the pressure exponent from zero to unity in trial pressure-correction laws yields only a 6% variation in total columnar absorption for a concrete case. Estimates accurate within 10% with respect to the Fowle absorption data are attainable for levels below about 400 mb in humid regions. However, clarification of the method employed by HOUGHTON in arriving at his roughly 30% greater absorptivities leaves doubt as to the status of the familiar Fowle absorptions, so it is concluded that we cannot now claim to be able to predict insolational heating rates to better than about 30% absolute accuracy. *Subject Headings:* **1. Solar radiation absorption 2. Absorption by water vapor.**—*Author's abstract.*

12.6–344 551.521.32:551.524.4:551.551.8:551.575.1

Funk, J. P. (*C. S. I. R. O., Australia*), **Measured radiative flux divergence near the ground at night.** *Royal Meteorological Society, Quarterly Journal,* 86(369):382–389, July **1960.** 5 figs., 3 tables, 17 refs., 3 eqs. **DWB, DLC**—Nocturnal radiative flux divergence profiles in the lowest few metres have been directly measured and typical cases are presented in graphical form. Comparison of flux divergence calculated from radiation charts with measured divergence

between 0.5 m and 1.5 m for a wide range of wind speeds and cloud conditions have shown the measured value to be up to 2.8 times larger than the calculated one. This discrepancy and others are attributed to the presence of haze. Since radiative cooling rates were generally found to be higher than actual rates, development of the nocturnal inversion near the surface is shown to be predominantly caused by radiation, with eddy cooling supplanted in the lowest layers by eddy warming. Periods of radiative warming sometimes associated with long-period (40 min) air-temperature fluctuations were found. A possible explanation is given for these and for fog formation in airlayers not in direct contact with the surface. Comparisons are given between radiative ground temperatures and those obtained from standard grass thermometers. *Subject Headings:* **1. Nocturnal radiation data 2. Fog formation 3. Temperature inversions 4. Turbulent heat flux.**—*Author's abstract.*

TEMPERATURE (551.524)

See also: **Marked warmings of the stratosphere** (Behr), 12.6-28; **Turbojet aircraft performance characteristics and their met. implications** (Phillpot), 12.6-88; **Radiation balance of reservoirs** (Timofeev), 12.6-227; **Distribution of met. elements over Lake Valdai** (Konstantinov, Federova), 12.6-229; **Influence of Lake Balaton on humidity and temp.** (Péczely), 12.6-235; **Computation of humidity saturation deficit** (Kaczmarek, Zielińska), 12.6-253; **Temp. probability nomograms** (Lackey), 12.6-255; **Distant connection between temp. anomalies** (Teich), 12.6-299; **Stratospheric warming of Antarctic atmos.** (Alt), 12.6-311; **Measured radiative flux divergence** (Funk), 12.6-344; **Change in the sign of vertical movement on both sides of isobaric surfaces of an extremely high wind velocity** (Hollmann), 12.6-368; **Integrated runoff and mean monthly air temp.** (Arakawa, Tsutsumi), 12.6-403; **A weather period of great persistence, Budapest** (Berkes), 12.6 418; **Transformation of temp. and pressure pattern** (Graics), 12.6-439.

12.6-345 551.524.31:551.578.46

Ashwell, I. Y. and Hannell, F. G. (*Dept. of Geog., Univ. of Bristol*), **A rapid variation of air and crustal temperatures on Langjökull.** *Geografiska Annaler*, Stockholm, 41(1):67-73, **1959.** 5 figs., 12 refs. **DLC**—The phenomenon of sudden increase of air temperature at screen level above snow and ice surfaces is discussed. This is followed by a detailed examination of the conditions on the southern slope of The Langjökull ice cap during the cloudy night of Aug. 12-13, 1956 when the temperature at screen level increased suddenly above the stations established by the expedition of the British Schools' Exploring Society by so much as 2-5°C over intervals of 2-3 hours. The movements of air in contact with the south facing slope at each of the four stations are described with the aid of an hourly record of the variation of the meteorological elements and lapse rates for Aug. 12 plotted on a tephigram. At station B the temperature rose 2.2°C between 2200 and 2400 o'clock as a result of the release of latent heat by condensation while at station C the same mechanism resulted in a temperature rise of 4.5°C between 2300 and 0200 o'clock. At station D the increase of temperature between 2400 and 0300 o'clock amounted to 4.9°C. The results of observations on snow crust temperatures are presented in graphs and analyzed in the light of the studies undertaken by Sverdrup on the Isachsen's Plateau in 1934. *Subject Headings:* **1. Air temperature variations 2. Snow crust temperatures 3. Langjökull, Sweden.**—*I.L.D.*

12.6-346 551.524.34:551.583.14(711)

Crowe, R. B., **Recent temperature fluctuations and trends for the British Columbia Coast.** *Canada. Meteorological Branch, CIR*-3137, TEC-288, Dec. 18, **1958.** 11 p. 8 figs., 3 tables, 6 refs. **DWB, DLC**—Five-year running averages of mean annual temperature and cumulative percentual deviations of these are plotted for selected British Columbia coast stations. Thirty-year averages and percentual deviations of mean annual temperature are tabulated for the same stations. The same procedure is followed with mean seasonal and mean annual temperature for Agassiz, B.C. A general rising trend in mean annual temperatures of from one to two degrees Fahrenheit over the fifty-year period beginning about 1900 is found for the British Columbia coast. This rising trend is most pronounced in winter and least evident in summer, and there is some evidence that the trend may have begun to level off or may have

ended. An irregular period of fifteen to twenty years between successive major maxima or minima of mean annual temperature is noted. Fluctuations of mean seasonal temperature are more irregular than those of annual values. *Subject Headings:* **1. Temperature fluctuations 2. Climatic trends 3. British Columbia.**—*Author's abstract.*

12.6–347 551.524.35

*Dué Rojo, Antonio, **Nota sobre algunas anomalias térmicas en España.** [Note on thermal anomalies in Spain.] *Revista de Geofisica*, No. 62:193–199, **1957?** fig., table. Reprinted as *Granada. Observatorio de Cartuja, [Publication], Ser. B, Trabajos Cientificos*, 12(100), **1958. DWB**—Using 44 years (1903–1956) of data of the Cartuja Observatory, the author computed from each monthly series of the lowest maxima and or highest minima the arithmetic means of 54 years for each month, the amplitudes of the daily variation (means of the maxima and the minima). It was observed that the amplitudes of daily variation are the same for the months with the highest and lowest anomalies, the coincidence of the mean temperatures with the arithmetic mean of the maxima and minima simply indicates that they are either situated or displaced at an amplitude equal to the mean normal oscillation. In Granada the normal oscillation is 10°C winter and 18°C in summer. The most conspicuous exception of this rule namely the occurrence of the highest maxima in July and Aug. and the lowest minima in winter are considered in relation to synoptic conditions, and specific instances of extreme highs and lows during the 54 year period are considered. *Subject Headings:* **1. Temperature anomalies 2. Long period temperature records 3. Spain.**—*I.L.D.*

12.6–348 551.583.14:551.524.37(474.5)

Kaushila, K. A., **Vekovoĭ khod zamorozkov po dannym meteostantsii Vil'nius.** [Secular frost variations according to data from the Vilnyus meteorological station.] *Lietuvos TSR Mokslų Akademija. Geologijos ir Geografijos Institutas, Moksliniai Pranešimai*, Vol. 3, Geofizika, Hidrologija, issued Vilna, **1956.** p. 105–107. 3 tables.—Frost indices in the Lithuanian S.S.R. show considerable variability. For 1871–1953 it has been possible to establish a fluctuation of the number of spring frosts with a cycle close to the so-called cycle of solar activity. Ten year sliding means yielded a curve with a cycle close to the so-called Bruckner cycle and a range of 15 days. Cyclical fluctuations of frost indices are closely associated with temperature fluctuations. The variation of solar radiation flux influences the frost indices indirectly through oscillations in the intensity of the atmospheric circulation. Intensified circulation of the atmosphere involves, in Lithuania, increased influx of Atlantic and Arctic air. The spring months become cooler but the fall months become warmer. Together with the intensified Arctic circulation the cooling singularities at the end of spring deepen. Favorable conditions are established for later occurrence of spring frosts. In the fall the inflow of warm Atlantic air brings about a later occurrence of frosts. When the atmospheric circulation is weakened continentality becomes more pronounced. The weakened Arctic incursions of late spring do not produce frosts but during calm fall weather the probability of early frost is increased. *Subject Headings:* **1. Secular frost variations 2. Frost indexes 3. Bruckner's cycle 4. Vilnyus, Lithuania.**—*I.L.D.*

12.6–349 551.506.3:551.524.37(474.5)

Ol'shauskas, S. K., **K voprosu o zamorozkakh na territorii Litovskoĭ SSR.** [Problem of frost in Lithuania.] *Lietuvos TSR Mokslų Akademija. Geologijos ir Geografijos Institutas, Moksliniai Pranešimai*, Vol. 3, Geofizika, Hidrologija, issued Vilna, **1956.** p. 59–61. table.—The characteristics of frost occurring in the Lithuanian S.S.R. are described on the basis of weather observations and synoptic maps for 1947–1951. The very latest data of the last frost according to observations in the instrument shelter and at the soil surface occurs on June 6, the very earliest data of the last frost occurs on April 8, according to observations in the instrument shelter and on April 26 at the soil surface. The very earliest date of the last frost according to instrument shelter data and at the soil surface occurs on Sept. 11; the very latest date of the first frost occurs on Oct. 31, according to data of the instrument shelter and at the soil surface. The duration of the frost face period according to instrument shelter data, is a maximum of 198 days and a minimum of 101 days; at the soil surface a maximum 187 days and a minimum of 101 days. The mean minimum temperature (−2.4°C) during frost

in April is observed in the extreme south and the mean maximum (−1.6°) along the coast, etc. The characteristics of frosts in October and May are described. On the basis of synoptic conditions six types of frosts are established and the properties of each type are summarized. *Subject Headings:* **1. Frost data 2. Frost types 3. Lithuanian S.S.R.**—*I.L.D.*

12.6–350 551.506.3:551.524.37(797)

*Phillips, Earl L. (*State Climatologist, U. S. W., Seattle, Wash.*), **Probable occurrence of freezing temperatures in the Walla Walla and Yakima Valleys of Washington during the spring and fall.** Seattle, Wash., U. S. Weather Bureau, Feb. **1958.** unpaged. Almost entirely tables. Mimeo. **DWB** (M24.36U587pr)—Probabilities (90%, 80% . . . 20%, 10%) of selected temperatures (24°, 28°, 30°, 32°F) occurring on or after given dates in spring and on or before given dates in the fall, and actual dates each year of last occurrence of 24°, 28°, 30° and 32° in spring and earliest in fall, with actual temperature observed in each case from earliest record (1892 or later) are given for 11 stations in Yakima and Walla Walla Valleys of Washington, Benton City, Dayton, Kennewick, Moxee, Naches Heights, Prosser (2 stations), Sunnyside, Walla Walla, Wapato and Yakima. *Subject Headings:* **1. Freezing temperature data 2. Frost probabilities 3. Yakima Valley, Washington 4. Walla Walla, Washington.**—*M.R.*

12.6–351 551.524.37:551.506.3(797)

Phillips, Earl L. (*U. S. W. B., Seattle Wash.*), **Probable occurrence of freezing temperatures in the Wenatchee-Okanogan fruit producing area in Washington during the spring and fall (Chelan, Douglas and Okanogan Countries.)** *Seattle, Wash., U. S. Weather Bureau,* Feb. **1958.** unpaged. map, chart, 12 refs. Mostly tables. **DWB** (M24.37 U587pro)—Probabilities of 24°, 28°, 30° or 32°F occurring after a given date in spring or before a given date in the fall on 10%, 20% . . . 90% of the years and the extreme earliest and latest dates in fall and spring, and the actual dates of first occurrence of these temperatures in fall and last in spring each year from 1910–1956 at Omak, Winthrop, Brewster, Malott, Lakeside, Leavenworth, Wenatchee and Trinidad in Okanogan, Chelan and Douglas Counties of north central Washington, are tabulated. *Subject Headings:* **1. Freezing temperature data 2. Frost probabilities 3. North Central Washington.**—*M.R.*

12.6–352 551.524.37(777)

*Thom, H. C. S. (*Office of Climatology, U. S. W. B.*) and Shaw, R. H. (*Agronomy Dept., Iowa State College*), **Climatological analysis of freeze data for Iowa.** *Monthly Weather Review,* Wash., D. C., 86(7):251–257, July **1958.** 4 figs., 9 tables, 12 refs., eqs. **DWB, DLC**—A set of freeze thresholds is defined which replaces the loosely defined element "killing frost." Freeze series are tested and found to be random. This makes it possible to fit frequency distributions. It is hypothesized that these distributions are normal and a test of significance verifies this. A hypothesis that the variance parameter is constant over Iowa is tested and found to be true. It is shown that spring and fall freeze are independent and this results in a simple form of freeze-free period distribution. The calculation of probabilities of freeze and freeze-free season are explained. *Subject Headings:* **1. Freezing index 2. Frost distribution 3. Frost probabilities 4. Iowa.**—*Authors' abstract.*

12.6–353 551.511:551.524.7

Jefferson, G. J. (*Meteorological Office, Great Britain*), **The use of 1000–500 mb. thickness to determine the freezing level.** *Meteorological Magazine,* London, 89(1,058):222–231, Sept. **1960.** 6 figs., 2 tables, 2 refs. **DWB, DLC**—It is considered that the average thickness for a given freezing level is represented by conditions with a lapse rate equivalent to the saturated adiabatic lapse rate. A diagram is constructed giving "practical minimum thicknesses" and "practical maximum thicknesses" for given freezing level. The "practical maximum thickness" is taken as coinciding with a dry adiabatic from 1000 mb to −0.5°C an isothermal for 200 mb above this and a saturated adiabatic above to 500 mb. For the "minimum practical thickness" a saturation adiabatic curve is used from 500 mb to the freezing level or to 700 mb, whichever is the lower and below this either an isothermal at 0°C or a straight line (on a T–Ø gram) to 0°C. The acceptance of these values is justified by an examination of a considerable

number of upper air ascents from widely spaced stations. *Subject Headings:* **1. Freezing level thicknesses 2. Upper air temperatures.**—*R.B.*

12.6–354 551.524.73:551.521.67

Ward, Frederick W., Jr. (*AF Camb. Res. Center*), **Atmospheric temperatures and solar activity, Pt. 1, 100 mb in the Northern Hemisphere auroral zone.** *Journal of Meteorology*, Boston, 17(2):130–134, April **1960.** 7 figs., 2 refs. **DWB, DLC**—An attempt is made to determine whether there are systematic temperature changes in or near the Northern Hemisphere auroral zone at 100 mb due to anomalous solar corpuscular radiation. A number of tests is conducted yielding generally negative results. The one possible exception is a test indicating a temperature rise of approximately 1°C following magnetic storms which were preceded by at least one week of relatively undisturbed (geomagnetically) conditions. The usual significance tests show the increase to be significant above the five per-cent level. However, the results of other tests do not tend to confirm this result, and hence there is some doubt as to its reality. In any event, an upper limit of approximately 1C is indicated as the largest average systematic rise to be expected at 100 mb from solar corpuscular storms. *Subject Headings:* **1. Upper air temperature variations 2. Corpuscular radiation.**—*Author's abstract.*

WATER TEMPERATURE (551.526)

See: **Gas conditions in lake water, Lithuania** (Klimakaitė), 12.6–216; **Temp. conditions in ponds** (Kühlmann), 12.6–226; **Radiation balance of reservoirs** (Timofeev), 12.6–227; **Thermal conditions, Lake Sevan** (Aĭnbund), 12.6–228; **Distribution of met. elements over a water surface and thermal regime of Lake Valdai** (Konstantinov, Federova), 12.6–229; **Thermal regime, Lake Valdai** (Konstantinov, Federova), 12.6–230; **Thermal and wind regime, Lake Sevan** (Vorontsov), 12.6–233; **Miclimat. characteristics in a dune** (Nakagawa), 12.6–425.

PRESSURE AND WIND

PRESSURE (551.54)

See: **Int. air routes, S. Hemisphere** (Laroque), 12.6–89; **Pressure data, Bermuda** (Macky), 12.6 266; **Tidal oscillations obtained from 300 mb transosonde data** (Angell), 12.6–268; **Change in the sign of vertical movement on both sides of isobaric surfaces of an extremely high wind velocity** (Hollmann), 12.6–368; **Transformation of temp. and pressure pattern** (Graics), 12.6–439.

TURBULENCE (551.551)

See also: **Aerological investigations of the boundary layer** (Vorontsov), 12.6–15; **Turbulent heat exchange between ice cover and air, central Arctic** (Iakovlev), 12.6–60; **Distribution of met. elements over Lake Valdai** (Konstantinov, Federova), 12.6–229; **Spectra of large scale turublent transfer** (Chiu), 12.6-317; **Diabatic wind profile** (Panofsky et al.), 12.6–331; **Measured radiative flux divergence** (Funk), 12.6–344.

12.6–355 551.551.5:551.557.5:551.510.528

Baroni, Andrea, **La turbolenza alle alte quote.** [Turbulence aloft.] *Rivista di Meteorologia Aeronautica*, Rome, 19(4):37–40, Oct./Dec. **1959.** Italian, French, English and German summaries p. 37. **DLC**—On the basis of recent studies, the author summarizes the current state of knowledge on clear air turbulence. Turbulence aloft tends to decrease with altitude; it reaches its maximum probability between 7500–900 m. Wind shear plays an important role in turbulence. Wind shear produced by horizontal squalls causes persistent turbulence compressed within a layer of 600–1000 m that acts along the line of the jet stream. The major part of turbulence cases is attributed to wind velocity maxima. As a result of the propagation of such a maximum in the direction of the jet streams the tropopause is lowered and the characteristic thermal inversion becomes accelerated causing an increase in the vertical

shear which should produce turbulence. Examination of vertical sections of jet strea shows the interruption of the tropopause corresponding to the axial zone of the jet strea In the layer compressed between two tropopauses the flow is sufficiently uniform and if tu bulence occurs it is of thermal origin. This interaction between turbulence and tropopaus is a consequence of the interaction of two fluids of different densities. The relationship betwe clear air turbulence and cloud type is considered. *Subject Headings:* **1. Atmospheric turbulenc 2. Wind shear 3. Jet stream effects 4. Tropopause turbulence.**—*I.L.D.*

12.6–356 551.551.5:551.557:629.135.

Kurilova, Iu. V. and Khachatrian, S. P., **Nekotorye dannye o strukture atmosferno turbulentnosti, vyzyvaiushcheĭ boltanku samoleta.** [Some data on the structure of atmos pheric turbulence causing bumpiness in flight.] *Moscow. Tsentral'naia Aerologicheskai Observatoriia, Trudy*, No. 31:79–82, **1959.** fig., 4 tables, 2 refs. **DLC**—Specific structure c turbulences at altitudes of 13–14 km and characteristics of single turbulence and turbulen zone are described with reference to their altitudes. The studies were made during 54 flight with the instrumental recording of overloads, altitudes, velocity of flights and positions c altitude control. The data given in this article are only of a preliminary character. Th processing of the recorded data is described with the tabulated values of the gusts of variou intensities and graphical illustration of their distribution as to the altitudes. The character istics of turbulent conditions are compared with the bumpy flights of two aircraft: a Tu-10 and a small jet in the upper troposphere and lower stratosphere. The heavier aircraft (Tu-104 is found less susceptible to strong gust than the jet. *Subject Headings:* **1. Atmospheric tur bulence 2. Gusts 3. Aircraft response to atmospheric turbulence.**—*N.P.S.*

12.6–357 551.551.5:629.135.

Kurilova, Iu. V. and Khachatrian, S. P., **O strukture atmosfernoĭ turbulentnosti p dannym skorostnykh samoletov.** [The structure of atmospheric turbulence determined fron the data obtained by high-speed airplanes.] *Meteorologiia i Gidrologiia*, Leningrad, No. 8:8 12, Aug. **1959.** fig., 4 tables, 6 refs. **DWB, DLC**—This study deals with the characteristic of turbulence at altitudes up to 13–14 km, in particular with the properties of single disturb ances, the nature of turbulence zones and their dependence upon height and intensity. The results of the investigation were as follows: 1) the coefficient of turbulence perceptibly de creased with height; 2) with the decrease in intensity and increase in height in turbulence spectre producing aircraft bumpiness, the weight of large disturbance increases; 3) the extent of the zone of atmospheric turbulence may attain 150 km in individual cases but in most instances it does not exceed 30–50 km. The extent of zones with moderate turbulence decreases with height. The extent increases with height in the case of weak turbulence. In the lower troposphere the length of disturbed zones increases as the maximum loads increase. Under otherwise equal conditions the dimensions of disturbed zones are less according to the data of TU-104 aircraft, since the aircraft is more stable and responds to a narrower overloading zone. In the upper troposphere and lower stratosphere turbulence zones are characterized by dis continuous structure in so far as TU-104 are concerned. *Subject Headings:* **1. Atmospheric turbulence 2. Turbulence zones 3. Aircraft response to atmospheric turbulence.**—*I.L.D.*

12.6–358 551.551.5:551.509.318

Rosenthal, Stanley L. (*Florida State Univ.*), **Some estimates of the power spectra of large-scale disturbances in low latitudes.** *Journal of Meteorology*, Boston, 17(3):259–263, June **1960.** 7 figs., table, 8 refs., 15 eqs. **DWB, DLC**—Power spectra, covering a range of periods of from 1.2 to 30 days of the zonal- and meridional-wind components at the 5000- and 40,000-ft levels at seven low latitude stations are presented. A brief discussion of the spectra is given. *Subject Headings:* **1. Large-scale disturbances 2. Low latitude disturbances.**—*Author's abstract.*

HORIZONTAL DISTRIBUTION AND VARIATIONS OF WIND (551.552/3)

See: **Prevailing winds in the Atlantic Ocean** (Markgraf), 12.6–47; **Regime of lower troposphere during summer monsoon, Vladivostok region** (Il'inskiĭ), 12.6–380; **Channelling effect of a valley** (Spurr), 12.6–438.

WIND VARIATIONS AND SPECIAL WINDS (551.554/5)

See also: **North winds in summer, Lake Sevan** (Selezneva), 12.6–232; **Diabatic wind profiles** (Panofsky et al.), 12.6–331; **Unusual halo phenomenon** (Marquardt), 12.6–445.

WIND EFFECTS (551.556)

See also: **Influences of wind waves on ice formation in reservoirs** (Dobrovol'skaia, Pekhovich), 12.6–220; **Measuring wind waves on Tsimlyansk reservoir** (Kokoulin), 12.6–222; **Dynamic phenomena in water reservoirs** (Labzovskiĭ), 12.6–223; **Wind induced water level variations, Tsimlyansk reservoir** (Karaushev), 12.6–242.

12.6–359 551.556.2:551.578.466

Kaiser, H., **Schneeverwehungen an Windschutzanlagen, eine Gefahr für Felder und Wege?** [Are snowdrifts along windbreaks a hazard to fields and roads?] *Umschau*, Frankfurt a.M., 33–36, Jan. **1960.** 8 figs., 5 foot-notes, 12 refs. German summary p. 33. **DLC**—With the aid of diagrams and illustrations, the author discusses the form and position of snow and sand drifts as influenced by velocity of wind penetrability of the shelter belts, height of trees, and wind permeability of the shelter belts near the ground, dependence of amount of snow drift deposited upon wind, penetrability of shelter belts and the dependence of snow accumulations upon wind direction and topography. Practical recommendations for the construction of suitable shelter belts in snow threatened regions are presented. *Subject Heading:* **1. Shelter belt effects on snow cover.**—*I.L.D.*

12.6–360 551.556.3(584.1)

Kolodin, M. V., **Vetrovoĭ rezhim i usloviia vetroispol'zovaniia v Turkmenskoĭ SSR.** [Wind regime and wind utilization conditions in the Turkmen S.S.R.] (In: Akademiia Nauk SSSR. Energeticheskiĭ Institut, **Voprosy vetroenergetiki,** Moscow, **1959.** p. 11 21. 3 figs., table, 16 refs., 6 eqs.) **DWB** (M56.3 A313vo)—The data on the wind regime of a given locality must be evaluated for actual possible use of the wind energy for agriculture and other needs. The wind characteristics of Turkmenistan are reviewed from data of various investigators listed in sixteen references. Attention is given to average daily and annual intensity of wind in different localities of this region, daily variations in direction and intensity, frequency of wind velocity, possible time of wind motor action at given velocities. Average wind velocity, determined by the meteorological observation, is statistically analyzed and plotted against working days for slow and fast moving wind motors. The distribution of the wind motors of various types at different localities of Turkmenistan is described in the text and shown on a map. *Subject Headings:* **1. Wind regime 2. Wind power utilization 3. Turkmen S.S.R.**—*N.P.S.*

12.6–361 551.556.3

Koshechkin, V. V., **K voprosu o predel'nykh energeticheskikh pokazateliakh vetroelektricheskogo agregata s vodorodnym akkumulirovaniem energii vetra.** [The problem of energy capacity of a combined wind and power generator using a hydrogen storage system.] (In: Akademiia Nauk SSSR. Energeticheskii Institut, **Voprosy vetroenergetiki.** Moscow, **1959.** p. 82–89. 4 figs., 2 tables, 17 eqs.) **DWB** (M56.3 A313vo)—Utilization of wind energy for generating electricity (by electric generator) and for production of hydrogen by the electrolysis of water is described in detail. Accumulated and compressed hydrogen are used for the operation of the heat engine in place of wind motor installation during periods of weak winds. Data on the efficiency of wind energy in the production of power by a simple hydrogen storage system or by a more efficient engine, operated by hydrogen-oxygen fuel, are extensively discussed, with analysis of favorable factors in the electrolysis and efficiency of hydrogen fuel in engines. Some results of computation and experimental research of the working processes with carburetion and injection of hydrogen fuel are described with tabulated data and comparative indicator diagrams of the engine operated on hydrogen and gasoline fuels. The effects of air ratio or oxygen ratio are illustrated graphically for different cases. *Subject Headings:* **1. Wind power utilization 2. Hydrogen fuel.**—*N.P.S.*

12.6–362 551.556.4:551.510

Bagnold, R. A., **The re-entrainment of settled dusts.** *International Journal of Pollution*, London, 2(4):357–363, June 1960. 2 figs., 3 refs. **QWB, DLC**—The re-entrainment of settled dust deposits depends on a number of variable factors concerning both the interstructure of the wind and the composition and structure of the deposit. Owing to lack understanding of the nature and magnitude of cohesive forces between fine particles quantitative knowledge is confined largely to the entrainment of particles bigger than 80μ by stea parallel fluid flow. Under steady conditions the determining property of the wind is the dr it exerts on the boundary surface of the deposit. This drag can be inferred from measureme of the velocity gradient. The threshold wind gradient at which the deposit surface is c turbed decreases with particle size to a minimum of about 100μ. Its increase as the size further reduced; is due in the first instance to the effects of air viscosity. But cohesive effe soon become dominant, and seem capable of increasing the resistance to disturbance in finitely. Deposits of fine powders can, however, be readily dispersed by the ballistic impa of dust particles larger than 100μ and locally by previous mechanical disturbances which ha caused sharp edges of the deposit to protrude into the wind stream. *Subject Heading:* **1. Dr re-entrainment.**—*Author's abstract.*

12.6–363 551.556.4:551.510.41:551.464:551.57

Kita, I. and Aya, T., **Observation of the scattering of saline drops near the seasho inland by strong wind.** *Journal of Meteorological Research*, Tokyo, 11(5):373–376, May 19 5 figs. (incl. photos), 14 refs., eqs. In Japanese; English summary p. 373. **DWB, DLC** The authors have examined the quantity of salinity in sea water drops which fell on the grou surface at 11 inland points, about 1000 m distant from the seashore in the direction of wind i monsoon season, 1955~1956. The results are summarized as follows: (1) The relation of t salinity quantity (q) to the distance from the shore line (D) is shown in Fig. 4 and by t following equation: $q = e^{0.34v+0.8} \cdot D^{-1}$, where q denotes Cl in mg m^{-2} hr^{-1}, v the wind velocity m sec^{-1}, and D the distance from the shore line in meters. (2) The quantity of salinity fall on the ground area in m^2 in one hour is obtained from Fig. 5, where the wind velocity is tak as ordinate, and the distance from the shore line as abscissa. The total quantity of salinity which fell on an area one meter wide and 1000 m long, far inland, may be computed by t following equation: $Q = e^{0.34v+2.7}$ (mg hr^{-1}). *Subject Headings:* **1. Saline nuclei migrati 2. Salt spray transport.**—*Authors' abstract.*

UPPER AIR WINDS (551.557)

See also: **Reversal of stratospheric winds over N. America** (Belmont), 12.6–24; **Upper winds over the world** (Heastie, Stephenson), 12.6–25; **Upper wind statistics** (Crutcher), 12.6–46; **Turbojet aircraft performance characteristics and their met. implications** (Phillpot), 12.6–88; **Estimating gradient wind from forecast contour charts** (Lumb), 12.6–92; **Effect of upper air winds on satellites** (Faulkner), 12.6–103; **Statistical variation of wind with distance** (Durst), 12.6–261; **High altitude wind data** (Armstrong, Garrett), 12.6–276; **Stratospheric warming of Antarctic atmos.** (Alt), 12.6–311; **Zero layer property of surfaces of extreme wind intensity** (Hollmann), 12.6–322; **Jet streams and upper fronts, Far East** (Mohri), 12.6–335; **Turbulence aloft** (Baroni), 12.6–355; **Structure of atmos. turbulence** (Kurilova, Khachatrian), 12.6–356.

12.6–364 551.557.2:551.513

†Serebreny, Sidney M.; Wiegman, Eldon J. and Hadfield, Rex G., **Models of jet strea structure.** Pan American World Airways, Inc., Pacific-Alaska Division. Meteorolog Dept., Contract N189(188)-42246A, Technical Report No. 9, Jan. **1960.** 36 p. 21 figs 10 refs. **DWB** (M57.2 P187st)—A study of the structure and distribution of the jet strea in the Northern Hemisphere with a view to constructing jet stream "models" that woul prove useful when forecasting in areas of sparse data. The extensively illustrated discussio is divided into two sections. In the first section, the types of jet streams, jet stream win profiles, jet streams and characteristic temperature soundings and zonal distribution of je streams are studied. The second section discusses the four basic configurations and their cas histories. *Subject Heading:* **1. Jet stream structure.**—*I.S.*

12.6–365 551.557.2:532.59:551.436(581)

Sinha, M. C., **Upper air standing waves over Kabul Valley.** *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 32(3/4):215–236, **1960.** 16 figs., 4 tables, 9 refs., eqs. German, English and French summaries p. 215 216. **DWB, DLC**—Kabul Valley runs nearly north south and is surrounded by a high mountainous region over which generally a solid northwesterly to westerly flow exists. The atmosphere is generally stable and these westerlies strengthen with height. These conditions are very suitable for the formation and the maintenance of upper air standing waves. Pibal observations, using the tail method, taken at Kabul Airport Observatory for the period 15–30th Nov. 1958 were studied. It was found that sets of well formed upper air standing waves superposed upon each other are actually present over Kabul Valley on most occasions. These waves generally exist during fair weather, but with the approach of disturbances in the westerlies or on some summer afternoons, these waves break down into a turbulent flow. These waves again reappear when these disturbances pass away. In addition to these upper air standing waves, it is also inferred from the wind data at and near the ground level, that there are at lower levels standing eddies on most occasions in the vicinity of Kabul Airport. *Subject Headings:* **1. Upper air standing waves 2. Kabul, Valley, Afghanistan.**—*Author's abstract.*

12.6–366 551.557.3

Ebdon, R. A. (*Met. Off., Harrow*), **Notes on the wind flow at 50 mb in tropical and subtropical regions in January 1957 and January 1958.** *Royal Meteorological Society, Quarterly Journal*, 86(370):540–542, Oct. **1960.** 4 figs., table, ref. **DLC, DWB** -In Jan. 1957 the mean 50 mb flow pattern was persistently E'ly over large areas near the Equator and this is compared with the flow pattern of Jan. 1958 which was predominantly W'ly over much the same area. The mean vector winds for Canton Island for six Januarys show a remarkable 2-yr periodicity and suggest that either an E'ly or W'ly flow is equally likely to occur. *Subject Headings:* **1. Wind flow patterns 2. Canton Island.**—*Author's abstract.*

12.6–367 551.557.5:551.511.13 551.510.528

Dahler, H., **Die Bedeutung der Temperaturadvektion für die Bildung und Verlagerung von Strahlstrom und Tropopause.** [The effects of advective temp. changes on the formation and displacement of jet stream and the tropopause.] *Zeitschrift für Meteorologie*, Berlin, 13(9/10): 205–211, Sept./Oct. **1959.** fig., 6 refs., 4 eqs. German, English and Russian summaries p. 205. **DWB, DLC**—Formation, movement and dissipation of jet streams are closely related to advective changes of temp. Formation or intensification of jet streams of the high troposphere occurs when in the cold part of the air flow there is an advection of even colder air and on its warm part there is at the same time an advection of even warmer air (confluence). These processes are reversed with the weakening or dissipation of jet streams (diffluence). Confluence or diffluence may occur with directional convergence and divergence of the air flow. (In the English meteorological technical terminology confluence is referred to as what is termed in German technical papers directional divergence, i.e., divergence of wind direction. As to the air flow the author, however, in accordance with Namias (1947, 1949), refers to any processes causing intensification of the horizontal temp. gradient and of wind velocity, and not simply a divergence of wind direction.) Comparatively infrequent cyclogenesis occurs when in the delta region, i.e. where divergence of wind direction is found, of the frontal zone or of the jet stream there is diffluence and at the opposite end, i.e., the region with convergence of wind direction, there is confluence—which is reverse to the normal. Confluence and diffluence are possible only on one side of the air flow. Along with the horizontal movement of polar and tropical air masses goes, similarily to the behaviour of isobaric surfaces, the movement of the comparatively low or high tropopause respectively. Stratospheric compensation of temp. of tropospheric temp. advection appears to be closely connected to large scale vertical motions caused by tropospheric temp. advection. For the determination of tropospheric and substratospheric temp. advection, which are of pronounced importance to jet stream and tropopause and to the whole of the weather development, cooling of the wind direction in tens of degrees should be replaced by coding in whole or just a few degrees. In addition, the radar wind wounding network should be spaced more closely. *Subject Headings:* **1. Advective temperature changes 2. Tropospheric temperature advection 3. Jet stream formation.**—*Author's abstract.*

VERTICAL MOTION (551.558)

See also: **Vertical air movement, Lake Sevan** (Vorontsov), 12.6-234; **Displacement of a stratified airstream crossing a ridge** (Sawyer), 12.6-329; **Formation of shower precip. and hail as affected by vertical motion** (Bibilashvili), 12.6-389.

12.6–368 551.558.1:551.524.72:551.5

Hollmann, G. (*Offenbach am Main*), **Zur Frage des Vorzeichenwechsels der Vertik bewegung beiderseits isobarer Flächen extremer Windgeschwindigkeit.** [Problem of t change in the sign of vertical movement on both sides of isobaric surfaces of an extremely hi wind velocity.] *Meteorologische Rundschau*, Berlin, 12(5):317–318, Sept./Oct. 1959. fi 2 refs., 22 eqs. German summary p. 137. **DWB, DLC**—Some relationships are inferr between vertical movement and temperature field on isobaric surfaces of extreme wind veloci Both sides of an isobar change signs of vertical motion when the isobaric surface is also t isothermic surface. In addition, vertical motion on the isobaric surfaces occur when t zero isoline of vertical motion lies on the isotherm of extreme temperature. *Subject Headin* **1. Vertical motion 2. Temperature distribution 3. Upper air pressure.**—*E.Z.S.*

12.6–369 551.558.1:551.576.1:551.577

Kachurin, L. G., **O sviazi mezhdu vertikalnymi dvizheniiami v atmosfere i intensivnost osadkov iz frontal'nykh oblakov sloistykh form.** [Relationship between vertical movemer in the atmosphere and the intensity of precipitation from frontal stratiform clouds *Leningrad, Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 76:50–60, **1958.** fig., tab 9 refs., 24 eqs. **DWB**—The author investigates the extent to which the presence of ascendi currents in the atmosphere are necessary and sufficient for the formation of precipitation clouds and the extent to which descending motions are a sufficient condition for the cessati of precipitation and attempts to establish a relationship between vertical currents and t intensity of precipitation for clouds from which precipitation is taking place, i.e., exami the intensity of precipitation under clouds from the point of view of moisture balance witho an analyses of the mechanism of precipitation formation. The formulas of A. S. Zverez ar Diubiuk for computing intensity of precipitation are discussed in regard to their physic meaning and the working formula for computing precipitation intensity is derived, namely:

$$T = \frac{-10\mu}{\rho_w k^2 N} \int_0^H \frac{E}{T_2} \left[W \left(\frac{\gamma L}{T} + \frac{gM}{N} \right) + \overline{\Delta T} \frac{L}{T} \right] \frac{\gamma}{\partial T}$$

(where F = tension of saturation water vapor, μ and M = molecular weight of water and ai ρ_w = water density, γ = moist adiabatic gradient, w = mean vertical wind velocity in a clou g = acceleration of gravity, T = temperature, N = Avogadro number, L = constant). Th computation of the integral is illustrated and computations with this formula are presente The results of calculation with the above formulas are presented and compared with actua results. The transformational changes in the formation of precipitation from frontal strat clouds is on the average less than ascending currents; in individual cases transformation is th fundamental factor in cloud formation. The causes of the considerable differences betwee intensity as computed by the above formula and actual intensity constitute the following insufficiently accurate calculation of the ascending currents, inaccurate determination of th transformed variation of temperature, unequal process of precipitation formation, tempora variation of stratification of cloudiness and temporal change of water content of clouds *Subject Headings:* **1. Precipitation from frontal stratiform clouds 2. Precipitation intensit computations.**—*I.L.D.*

12.6–370 551.553.11:551.558.1:061.

Pearce, R. P., **Convection in meteorology.** *Nature, London*, 188(4750):541–543, Nov. 12 **1960.** 4 figs., **DWB**—The first meeting of the Royal Meteorological Society ever to be hel in Dublin was opened by F. H. Ludlam and was devoted to the subject of "Convection." Ludlam reviewed the subject and quoted radar observations which showed that the vertica movement into and through a cumulonimbus was as much as 60 m.p.h. Dixon of Queen' College, Dundee, described experiments on convection currents using heated metal plates in a

tank of water. WARREN of the University of Sheffield described a mathematical theory to determine what proportion of kinetic energy of ascent of a thermal bubble was used in the production of gravity waves at an interface of a more stable layer. R. P. PEARCE of Queen's College, Dundee, explained a theory of sea breezes. *Subject Headings:* **1. Convection symposia 2. Convection currents 3. Sea breeze theories 4. Convective clouds.**—*R.B.*

12.6–371 551.558.21:551.43(449)

Berenger, Maurice, **Les ondes dues au relief dans les Basses Alpes françaises.** [Orographic waves in the Lower French Alps.] *Germany. Deutscher Wetterdienst, Berichte*, 8(54):190–193, **1959.** 7 figs., French summary p. 190. **DWB, DLC**—The methods and results of a study carried out at Saint Auban on the Durance, in the Lower French Alps, on the conditions determining the formation of ice waves of a mountain chain. Observations were made with the aid of specially equipped airplanes for exploring the first 4000 m of the atmosphere in the different mountain chains, constant level balloons and radar. The determining factors were found to be wind, air mass and relief. The wind plays a role through its direction and intensity, that is, it must blow perpendicularly to the ridge line and the velocity should be $\geq$10 to 12 m/sec. When a rotation of wind or a diminution of the wind occurs aloft there is a boundary zone of the wave movements. If the air mass is sufficiently humid (40% to 90% relative humidity) the characteristic clouds, which are quasi-stationary, reflect the wave movements. The relief exerts its influence by the duration and height of the effect. An isolated peak or a hill under similar meteorological conditions exerts less influence than an important mountain chain. A concave curvature of the ridge line exerts a greater effect than a convex one. The importance of the wave motions is characterized by the parameters of wave length and amplitude. The former independent of relief, is proportional to the wind component perpendicular to the ridge and is indirectly related to atmospheric stability; but it is more sensitive to the variation in wind speed than to variation in stability. The vertical amplitude of the wave is directly related to the stability and inversely proportional to the wind speed. *Subject Headings:* **1. Orographic effects 2. Lower French Alps.**—*I.L.D.*

12.6–372 551.558.21:551.43

Scorer, R. S., **Mountain wave research.** *The Aeroplane*, London, (Vol. 92?), p. 421–422, March 22, **1957.** 4 figs. Abstracted from photostat of separated pages. **DWB**—A mountain wave experiment conducted in southeast France in Jan.–Feb. 1956, 1957, is considered to have had the benefits of simplicity of design and good theoretical guidance. Radio-equipped gliders were towed into the waves to make a thorough exploration of wave characteristics. Measurements of temperature, humidity and pressure were made. A special innovation was the use of constant pressure balloons encased in silk envelopes, released from near St. Auban. The 1957 experiment demonstrated the presence of mountain waves during a clear day, above an inversion at 1700 m, with calm, hazy air below. The author anticipates that it will not be long before routine forecasts of the wave length of mountain waves can be made. A method for computing wave lengths electronically, using the author's theory, has been worked out. The French observations provide excellent material for testing the theory. *Subject Headings:* **1. Mountain waves 2. Southeast France.**—*R. S. Quiroz.*

AQUEOUS VAPOR AND HYDROMETEORS

HUMIDITY (551.571)

See also: **Influence of Lake Balaton on humidity and temp.** (Péczely), 12.6-235; **Water vapor fluctuations over a lake surface** (Staley), 12.6–236; **Computation of humidity saturation deficit** (Kaczmarek, Zielińska), 12.6–253; **Reduction of humidity obs.** (Kraus), 12.6–254; **Absorption of solar radiation by atmos. water vapor** (MacDonald), 12.6–343.

12.6–373 551.571.2/7:551.506(47)

*Elliott, F. E., **Mean monthly absolute humidity at station level for the U.S.S.R.** *General Electric Advanced Electronics Center, Cornell Univ., Ithaca, N. Y., Technical Information Series,*

No. DF60ELC9, Jan. 1960. 50 p. charts, 3 refs. Mostly tables. **DWB** (M71.2/47 E46m —A compilation of data, mean monthly absolute humidity at station level for the U.S.S.R. and 12 mean monthly maps of absolute humidity. The maps are overlays showing lines of equal absolute humidity. A base map is provided for use with the overlays. The tabulated data include 278 stations covering the U.S.S.R. (all are mean monthly without dates). *Subject Headings:* **1. Mean monthly absolute humidity data, U.S.S.R. 2. Mean monthly precipitation U.S.S.R. 3. Monthly maps of absolute humidity, U.S.S.R. 4. U.S.S.R.**—*E.Z.S.*

EVAPORATION—EVAPOTRANSPIRATION (551.573)

See: **Felt Lake evap. study** (Baker), 12.6–237; **Evap. from water surfaces, Calif.** (Blaney, Muckel), 12.6–238; **Evap. from lakes, Japan** (Ito), 12.6–239; **Penman formula for evap. from open water surface** (Keyman), 12.6–240; **Classification of lakes according to water balance** (Bogoslovskiĭ), 12.6–243; **Water balance of Khrami reservoir** (Khalatian), 12.6–244; **Water balance, Lake Baikal** (Afanas'ev), 12.6–245; **Obs. of evap., U.S.S.R.** (Konstantinov, Pushkarev), 12.6–248; **Experiments on evapotranspiration, Japan** (Suziki, Fukuda), 12.6–251; **Theory of evap. from natural earth surfaces** (Brogmus), 12.6–252; **Graphical presentation of energy budget measurements** (Lowry), 12.6–323.

CONDENSATION (551.574)

See also: **Effect of hoar frost on fog, Malton Airport** (Thompson), 12.6–90; **Cloud photography and cloud physics res.** (McDonald), 12.6–384; **Effects of elec. fields on water-droplet coalescence** (Goyer et al.), 12.6–396.

12.6–374 551.574.1:551.578.4

Fukuta, N.; Sano, I. and Asaoka, M. (*all, Nagoya Univ.*), **Observations of ice-formation on lead iodide single crystals.** *Meteorological Society of Japan, Journal*, Ser. 2, 37(6):274–278, Dec. **1959.** 2 figs., 8 refs. Japanese summary p. 278. **DWB, DLC** —This article deals with an experiment carried out with single crystals of lead iodide for the purpose of acquiring information concerning the mechanism of the heterogeneous ice nucleation effected by foreign solid materials in an atmosphere of a supercooled cloud of water. It includes a schematic drawing of the experimental apparatus and eight photographs of ice observed on lead iodide single crystals. *Subject Headings:* **1. Ice crystal formation 2. Supercooled clouds 3. Lead iodide nuclei.**—*E.Z.S.*

12.6–375 551.510.41:551.574.1

Papée, Henry M. (*Univ. of Ottawa*), **Activated salt surfaces in ice nucleation and growth and the formation of droplets.** *Journal of Meteorology*, Boston, 16(2):217–218, April **1959.** 13 refs. **DWB, DLC** —A review of various studies on nucleating agents and nucleating properties leads to the conclusion that a nucleating agent should have a somewhat distorted lattice in the immediate vicinity of the surface, a surface which would not sinter too quickly under exposure to water vapor and perhaps a surface which might become electrically charged under the influence of conditions available in the atmosphere. Experimental studies have shown that colored varieties of NaCl (color being the result of lattice defects) exist in nature and such colored NaCl crystals can be obtained from normal NaCl by the action of X-rays, electron beams, electric discharges or by heating NaCl with sodium. Colored NaCl has a low rate of sintering and its water vapor adsorption is accompanied by very large heat evolution. Since NaCl is present in the atmosphere where processes leading to strong radiochemical excitation takes place these results seem to be significant. The possibility of electrical gradients across a NaCl particle of a blue surface is considered. *Subject Headings:* **1. Ice nucleation 2. Droplet formation 3. Nucleating agents.**—*I.L.D.*

12.6–376 551.574.1:551.576.1:537.21

Sartor, J. (*Rand Corp., Santa Monica, Calif.*), **Some electrostatic cloud-droplet collision efficiencies.** *Journal of Geophysical Research*, Wash., D. C. 65(7):1953–1957, July **1960.** 2 figs., table, 16 refs. **DLC** —Recent electrostatic and hydrodynamic solutions to the two-body

problem of the forces on neighboring spheres are combined to determine the motion of cloud droplets in a uniform electrostatic field. Collision efficiencies are obtained from the relative trajectories of one droplet with respect to another both with and without the electrostatic field. The collision efficiencies are compared to demonstrate the effect of electrostatic fields in the initial stages of droplet accretion. It is concluded that fields commonly observed in clouds can play an important role in the collision and coalescence of the droplets. *Subject Headings:* **1. Cloud droplet collision efficiency 2. Electrostatics.**—*Author's abstract.*

12.6–377 551.574.11:551.578.41

*†Isono, K.; Komabayasi, M. and Ono, A. (*All, Tokyo Univ.*), **The nature and the origin of ice nuclei in the atmosphere.** *Meteorological Society of Japan, Journal, Ser.* 2, 37(6):211–233, Dec. **1959.** 10 figs., 10 tables, 28 refs. Japanese summary p. 233. **DWB, DLC**—Concentrations of ice-nuclei active at temps. of −13°C, −15°C and −20°C were observed with an ice nucleus counter in Tokyo, Japan. The concentrations varied from day to day in a wide range. Generally, higher concentrations occurred on days when air came from the continent of Asia and low concentrations occurred when air came from the Pacific Ocean. Abnormally high concentrations were observed when air reached Japan from the arid regions of North China and Mongolia where heavy dust storms occurred in front of cold fronts. Although the ice nuclei concentration was low in maritime air mass, sometimes high values were observed. This was found to be associated with volcanic eruptions. Possibility of production of ice nuclei from sea-spray is also discussed. The ice-forming abilities of volcanic ash from ten active volcanoes in Japan, of dust (loess) particles from North China which fell in Japan, and of soil particles and stone meteorites were determined in laboratory. It is concluded that the principal ice nuclei in the atmosphere are some kinds of soil particles (especially clay minerals) blown up from arid regions and volcanic dust from active volcanoes. *Subject Headings:* **1. Ice nuclei theories 2. Nuclei origin.**—*Authors' abstract.*

12.6–378 551.574.14:551.576.11:536.421

Kolesnikov, A. G. and Beliaev, V. I., **O kristallizatsii pereokhlazhdennogo vodnogo oblaka putem zamerzaniia kapel'.** [Crystallization of supercooled water clouds by droplet freezing.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 5:636–642, **1958.** 2 refs., 29 eqs. **DLC** - A system of equations describing the behavior of a supercooled aqueous cloud during its crystallization as a result of the freezing of water droplets is presented. The three initial equations describe the (1) freezing of the droplets, namely $n' = \beta vn$ (β = constant, v = volume of droplet); (2) growth of crystals and (3) evaporation of droplets, both of which are described by the equation of Maxwell $\rho_1 r_1 \frac{dr_1}{d\tau} = D(u - u_1)$ for droplets and $\rho_2 r_2 \frac{dr_2}{d\tau} = D(u - u_2)$ for crystals (r_1 = radius of drop, u_1 = concentration of vapor corresponding to the equilibrium of vapor and droplet, r_2 and u_2 = the same magnitudes for crystals, D = coefficient of molecular diffusion of vapor, ρ_1 and ρ_2 = density of water and ice, u = concentration of vapor at a distance from droplets and crystals). The equation for computing r_1, r_2, n_1, n_2 and u are also for computing the total amount of water contained in droplets of a cloud and the amount of ice formed in a cloud as a function of time, are developed. *Subject Headings:* **1. Supercooled water clouds 2. Freezing of water droplets 3. Nucleation of supercooled water.**—*I.L.D.*

12.6–379 551.574.2:546.57:546.15

Koenig, L. Randall (*Univ. Chicago*), **The chemical identification of silver-iodide ice nuclei: a laboratory and preliminary field study.** *Journal of Meteorology*, Boston, 17(4):426–434, Aug. **1960.** 10 figs., 12 refs. **DWB, DLC**—The technique and results of the application of a chemical test, explicitly for silver iodide, sensitive to a mass of 3×10^{-17} g, to laboratory-nucleated ice crystals and atmospheric ice crystals from cloud-seeding experiments in the field are described. In laboratory ice crystals, it was found that the silver-iodide nucleus was not always in the apparent "C" axis of the ice crystals. This deviation is discussed. Because of difficulties in the preservation of the ice crystals from the field experimentation, no evidence of the true role of silver iodide in cloud seeding was obtained. *Subject Heading:* **1. Silver iodide nucleation.**—*Author's abstract.*

FOG (551.575)

See: **Effect of hoar frost on fog, Malton Airport** (Thompson), 12.6–90; **Measured radiative flux divergence** (Funk), 12.6–344.

CLOUDS (551.576)

See also: **Tiros concludes mission**, 12.6–102; **Vertical cloud distribution** (Raubakken), 12.6–270; **Vertical extent of high level clouds** (Baranov), 12.6–309; **Radiational warming or cooling near the surface of clouds** (Lopukhin), 12.6–342; **Relationship between vertical movements and precip. intensity from frontal stratiform clouds** (Kachurin), 12.6–369; **Electrostatic cloud droplet collision efficiencies** (Sartor), 12.6–376; **Crystallization of supercooled water clouds** (Kolesnikov, Beliaev), 12.6–378; **Cloud cover, U.S.S.R.** (Schloss), 12.6–385; **Unusual halo phenomenon** (Marquardt), 12.6–445.

12.6–380 551.576.1:551.553.21(47)

Il'inskiĭ, O. K., **Rezhim nizhneĭ troposfery v raĭone Vladivostoka v period letnego mussona** [Regime of the lower troposphere in the Vladivostok region during the summer monsoon] *Meteorologiia i Gidrologiia*, Moscow, No. 7:25–27, July **1960.** 3 figs., 2 refs. **DWB, DLC** (QC851.M27)—A study has been made of occasions when stratus cloud, or fog, was observed at Vladivostok. Trajectories drawn for occasions with stratus in June 1956 all show a track from the sea. A study of occasions with no stratus shows that either the wind was from the land or the wind gradient from the sea was very weak. Radiosonde wind and temperature soundings from nearby Uglova have been analyzed up to 3 km for days with cloud, days without cloud but when cloud formed later, and days without cloud. These show trajectories from the sea and temperature inversions for days with cloud and a trajectory from the land with no temperature discontinuity for days without cloud. *Subject Headings:* **1. Stratus formation 2. Monsoon clouds 3. Vladivostok, U.S.S.R.**—*R.B.*

12.6–381 551.576.11:551.43

Musaelian, Sh. A., **Nekotorye zamechaniia ob usloviiakh vozniknoveniia chechevitseobraznykh oblakov.** [Conditions of the formation of lenticular clouds.] *Akademiia Nauk SSSR, Ser. Geofiz.*, No. 11:1725–1728, Nov. **1959.** 5 figs., 10 refs., 6 eqs. **DLC**—The effects created by movements of air over mountain barriers is considered as a simple kinematic process, causing formation of rising and lowering air currents and horizontal turbulence in the wind. However, the vertical velocities being purely mechanical phenomena create very complicated thermodynamic transformations further affecting the character of air currents. The vertical and horizontal components of velocity in air currents over mountain barriers are mathematically correlated with basic coordinates (x, y, z) of the location of mountain surfaces. These relationships are analyzed with respect to the angularity of these surfaces (to horizontal level), the modification of the air stream at various altitudes and their effect on formation of lenticular clouds. Reoccurrences of formation of these clouds are marked by isolines on a map of Scandinavia. The method of plotting these isolines is described in detail. Average monthly air currents observed at altitudes of 3 and 5 km are also plotted on two similar maps with the isolines for $A\Gamma 700$ and 500 mb. The analysis of actual observations indicates that the basic cause of formation of lenticular clouds is the specific character of waves caused by obstruction of the mountain barrier. *Subject Headings:* **1. Lenticular clouds 2. Orographic cloud studies.** —*N.P.S.*

12.6–382 551.576.11:551.511

*Shishkin, N. S., **Issledovaniia raspada konvektivnykh oblakov pri neustoĭchivoĭ stratifikatsii atmosfery.** [Investigations on the dissipation of convective clouds when the atmosphere is unstably stratified.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 102:21–49, **1960.** 11 figs., 6 tables, 7 refs., 7 eqs. Russian summary p. 21. **DWB**—With the aid of the method of layers, the author investigated the problem of the condition of development of convective movements in clouds during unstable atmospheric stratification, when the conditions of growth or disintegration of clouds are at an optimum. Equations for calculating the optimum amount of cloudiness and the supply of heat energy of convection are developed,

and the results of a specific computation of these quantities are presented. Extensive data on the disintegration of convective clouds obtained in the summers of 1956 and 1957 are presented and comparisons of observations with theoretical calculations of cloud disintegration are presented. Rather good agreement was found to exist. The disintegration of very thick convective clouds with vertical dimensions of 1.5 to 5 km can take place in 2–6 min in an unstable stratified atmosphere. During shower rainfall the disintegration of clouds, owing to "washing out" of precipitation, proceeds more slowly than the disintegration of clouds as a result of convection with active descending currents. *Subject Headings:* **1. Convective cloud dissipation 2. Unstable atmospheric stratification.**—*I.L.D.*

12.6–383 551.576.2(99)

Chesneau, Jacques (Météorologie Nationale, Paris), **Variations de la nébulosité des nuages élevés et moyens à la base Dumont-d'Urville.** [Nebulosity variation of high- and medium-level clouds at the Dumont-d'Urville base.] *La Météorologie*, Paris, 4e Ser., No 57, 135–140, Jan./March **1960.** 3 figs., 4 tables. French, English, Spanish and Russian summaries p. 135. **DWB**—The observations made at Dumont-d'Urville base reveal a seasonal variation and a diurnal variation of the nebulosity of medium and high clouds, apparently not connected with disturbances. The seasonal variation of the nebulosity of high clouds presents a minimum in winter and a maximum in summer. The diurnal variation of the nebulosity of high and medium clouds presents a maximum towards the middle of the day and a minimum during the night. *Subject Headings:* **1. Cloudiness data 2. Diurnal cloud variations 3. Dumont-d'Urville, Antarctica.**—*A.V.*

12.6–384 551.576.12:778.4 551.574.1

McDonald, J. E. (*Inst. Atmos. Physics, Univ., Ariz.*), **Cloud photography and cloud physics research.** *Weather*, London, 14(8):247–252, Aug. **1959.** 4 figs. **DWB**—A short paper reporting the profitable use of stereo-photography in cloud physics research of the Institute of Atmospheric Physics, University of Arizona. As an example, a photograph depicting orographic cumulonimbus in Arizona, taken with a stereo-camera, and its tracing with inserted comments explaining various items of a prominent nature, are included. The instrumental details of the camera and the techniques of photography are also discussed. *Subject Headings:* **1. Cloud photography 2. Cloud physics research.**—*I.S.*

12.6–385 551.582.3:551.576.2(47)

Schloss, Milton (*Allison Div., General Motors Corporation, Indianapolis*) **Cloud cover of the U.S.S.R.** Applied Science Staff, Advanced Weapon Systems Activity, March 17, **1960.** 15 p. 7 figs. (some fold), 3 refs. *EDR* No. 1718. **DWB** (M76 S345cL)—This report presents the results of a study of the cloud cover characteristics of the U.S.S.R. The study was based on data translated from Soviet publications in possession of the U. S. Weather Bureau, Washington, D. C. (The references to original articles are incomplete.) Two maps representing winter and summer, respectively, show the cloud cover (average percent of sky covered) (averages are not defined). Graphs show the monthly means of cloudiness over the European and Asian parts of the U.S.S.R., the relationship of monthly cloudiness and clear sky probability and the annual average and average monthly probability of clear skies over European U.S.S.R. The basic data and inferences are briefly discussed. *Subject Headings:* **1. Cloudiness data 2. Clear sky probabilities 3. European U.S.S.R. 4. Asiatic U.S.S.R.**—*E.Z.S.*

12.6–386 551.576.36

*de Bary, Elisabeth and Möller, Fritz, **Die mittlere vertikale Verteilung von Wolken in Abhängigkeit von der Wetterlage.** [Average vertical distribution of clouds in relation to weather conditions.] *Germany. Deutscher Wetterdienst Berichte*, No. 9(67). **1960.** 16 p. 68 figs., 8 tables, 6 refs. German and English summaries p. 3. **DWB, DLC**—By means of data determined by aircraft ascents from 1936–1940 and as published by the Reichswetterdienst, the mean cloud cover as a function of height was established for the summer and winter half-year. The material was sorted into 10 different weather conditions. Half of these were anticyclonic and the other half were cyclonic situations. Furthermore, the yearly distribution of cloudiness was considered for these weather conditions. A certain statistical uncertainty

exists. Finally, a survey of the vertical distribution of certain cloud types is given; however the cloud cover in percentages has not been considered. The purpose of this paper is to establish synoptic-statistical tables of the vertical distribution of clouds as they may be needed in atmospheric physics such as thermodynamics and infrared radiation. In addition to this, the airlines are also interested in an increased knowledge of the vertical cloud distribution. *Subject Headings:* **1. Annual cloudiness variations 2. Vertical cloud distribution.** —*Authors' abstract.*

12.6–387 551.576.4:551.515.8:551.551:551.558.1

Bogdanova, N. P. and Shvets, M. E., **Ob opredelenii nizhneĭ granitsy vnutrimassovykh sloistykh oblakov.** [Determination of the lower boundary of stratus clouds within an air mass.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 81:13–19, **1959.** 6 refs., 18 eqs. **DLC**—The height of the lower boundary of low St, Fr-st and Sc clouds within an air mass is investigated. The formation of low cloudiness within an air mass is determined fundamentally by turbulent exchange and vertical motion in the lower layer of the atmosphere. The equation expressing the boundary conditions is devised, namely:

$$\left.\frac{\partial q}{\partial z}\right|_{z=H} = \beta_1 q_m(H) \left.\frac{\partial T}{\partial z}\right|_{z=H}$$

where q = absolute humidity, q_m = maximum humidity, T = temperature, H = condensation level and z = height above the level of the earth and

$$\beta_1 = \frac{L}{A R_w T^2} - \frac{1}{T} \approx \frac{L}{A R_w T^2}$$

(L = latent heat of condensation, A = heat equivalent of work and R_w = zero constant for vortex vapor). Equations are derived for determining the condensation level taking into account only turbulent exchange and for calculating the vertical motion of the atmosphere. *Subject Headings:* **1. Stratus clouds 2. Cloud height 3. Vertical motion 4. Turbulent exchange effects on cloud structure.**—*I.L.D.*

PRECIPITATION (551.577)

See also: **Precip and levels of Lakes Michigan and Huron** (Brunk), 12.6–241; **Classification of lakes according to water balance** (Bogoslovskiĭ), 12.6–243; **Water balance, Lake Baikal** (Afanas'ev), 12.6–245; **Correlation and variability of precip. data** (MacDonald, Green), 12.6–264; **Numerical precip. forecasting** (Pone), 12.6–293; **Relationship between vertical movements in the atmos. and precip. intensity from frontal stratiform clouds** (Kachurin), 12.6–369; **Floods, Natal** (Young), 12.6–404.

12.6–388 551.577.1

Bergeron, Tor (*Met. Institute, Uppsala*), **Problems and methods of rainfall investigation: Address of the Honorary Chairman of the [Cloud Physics] Conference.** *American Geophysical Union, Geophysical Monograph*, No. 5:5–30, **1960.** 23 figs. **DLC, DWB**—The opening talk was given by Tor Bergeron, Chairman of the Cloud Physics Conference held at Wood's Hole, Mass., June 3–5, 1959. Consideration of the types of precipitation and their mechanism show that there are two main precipitative effects superimposed on all different kinds of precipitation: those of the wavy kind and those of the convective kind, or stationary lee-wave precipitation and convective streaks of precipitation. The talk was well illustrated with actual weather charts and maps collected from various countries and representing conditions at differing time intervals. Comments are made on radar study and its limitations. *Subject Headings:* **1. Precipitation formation 2. Precipitation studies.**—*E.Z.S.*

12.6–389 551.577.1:551.558

Bibilashvili, N. Sh.; Zaĭtseva, A. M. et al., **Vliianie izmeneniia vertikal'noĭ sostavliaiushcheĭ skorosti vetra na obrazovanie livnevykh osadkov i grada.** [The formation of shower precipitation and hail as affected by variations of the vertical component of wind velocity.] *Akademiia Nauk SSSR, Doklady*, 128(3):521–524, Sept. **1959.** 3 figs., table, 7 eqs., 4 refs.

DLC—Using observations on the vertical components of wind velocity, on temperature and water content of cumulus and strata cumulus clouds obtained in the Transcaucasus and Caucasus in 1956-1958, the authors computed the growth of cloud droplets in such clouds. The calculations showed that in the presence of large velocities of vertical currents the droplets do not grow on the ascending branch of the trajectory. The drops are retained in the upper part of the cloud where the velocities are small and the principle growth of drops or hail occurs in the presummit part of the cloud. Analysis of growth of drops taking into account the pattern of vertical wind velocity shows the following: (1) the growth of hail to $R \sim 2$–4 *cm* when W_m (velocity of initial currents) is 10–20 m/sec occurs in the presummit part of the cloud in the beginning of the descending branch of the hail trajectory and is determined by the equations

$$z = 2z_m + \frac{b}{a} - \frac{\gamma}{a}\sqrt{R} + \frac{\gamma^2}{2Aa^2} + \left[\frac{\gamma}{a}\sqrt{R_{BT}} - \frac{\gamma^2}{2Aa^2} - \frac{b}{a} - z_m\right]\exp\left[\frac{2Aa}{\gamma}\left(\sqrt{R} - \sqrt{R_{BT}}\right)\right]:$$

where z_m = level of maximum velocity; b = velocity of ascending currents; a = gradient of velocity with height; R = radius of drop; R_{BT} = radius at peak of trajectory; (2) the time necessary for the growth of hail to given dimensions depends upon W_m and varies between 20 and 70 min.; (3) the final dimensions of hail depend little on vertical thickness of the cloud. The accumulation of large reserves of water drops and hail occurs in the presummit zone of the cloud; this explains the intensity and short duration of shower rainfall and hail. The action of hygroscopic substances upon the upper part of a developing altocumulus cloud when $W_m > V_k$ (critical velocity of a drop) does not produce a positive effect. *Subject Headings:* **1. Shower formation 2. Vertical wind components 3. Wind effects on precipitation 4. Hail formation. I. Lapcheva, V. F. II. Ordzhonikidze, A. A. III. Sulakvelidze, G. K.**—*I.L.D.*

12.6–390 551.577.2(54)

*Hariharan, P. S. and Sajnani, P. P. (*Regional Met. Center, Bombay*), **A study of the spacial and frequency distribution of rainfall in the Ratnagiri District.** *Indian Journal of Meteorology and Geophysics*, New Delhi, 11(1):25–29, Jan. **1960.** fig., 9 tables, 3 refs. **DWB, DLC**—Refers to previous paper of similar nature but is concerned with south Hyderabad. The area chosen for this study is the Ratnagiri District of the Konkan on the west coast of Bombay State. A map showing the location of the stations is given. The rainfall data examined refer to the monsoon season for the five-year period 1946–1950. For describing the spatial distribution of rainfall, the gradations used in the Indian Met. Dept. have been used as indicated in the table. The criteria for describing the rainfall distribution in the Ratnagiri District are tabulated. In addition to the spatial distribution, the frequency distribution of mean rainfall of the district is given and the frequency of heavy rain is reported. The rainfall distribution in the project area is summarized. *Subject Headings:* **1. Areal precipitation distribution 2. Rainfall frequency distribution 3. Ratnagiri District, India.**—*E.Z.S.*

12.6–391 551.577.32

Griffiths, J. F. (*East African Met. Dept., Nairobi, Kenya*), **World variation in annual rainfall.** *Nature*, London, 183(4654):132, Jan. 10, **1959.** 2 tables, 2 refs. **DLC**—The analysis is based on the data given by Conrad, covering 358 stations in the belt 60°N–60°S. Values of probability versus difference of means of rainfall variation are tabulated. The broad result of the present investigation does not correspond with the statement frequently quoted that rainfall variation is much greater in the tropics than in the temperate regions. *Subject Headings:* **1. Annual rainfall variations 2. World rainfall variations.**—*E.Z.S.*

12.6–392 551.577.34(711)

Crowe, R. B., **Recent precipitation fluctuations and trends for the British Columbia coast.** *Canada. Meteorological Branch, CIR-3309*; TEC-318, Feb. 24, **1960.** 10 p. 3 figs., 2 tables, ref. **DWB, DLC**—Five-year running averages of total annual precipitation are plotted and thirty-year averages of total annual precipitation are tabulated for a number of British Columbia Coast stations. The same procedure is followed with total seasonal and annual precipitation for Agassiz, B. C. No significant decrease or increase in total annual precipitation has occurred over the British Columbia coast during the past half-century. An irregular

period of ten to twenty years between successive major maxima or minima of total annual precipitation is noted. Summer precipitation along the British Columbia south coast was significantly lower during the second quarter of this century than it was during the first quarter. *Subject Headings:* **1. Precipitation trends 2. British Columbia.** —*Author's abstract.*

12.6–393 551.577.35(434.1

*Fischer, Rudolf (*Darmstadt*), **Nasse und trockene Jahreszeiten in Frankfurt a.M. seit 1857.** [Wet and dry seasons at Frankfurt a.M. since 1857.] *Meteorologische Rundschau*, Berlin, 12(5):164–165, Sept./Oct. **1959.** tables, ref. **DWB, DLC** —Using the monthly and annual precipitation data given by Mollowo, the wet and dry seasons of spring, summer, fall and winter for each year are tabulated showing the percentage of standard value for each year. *Subject Headings:* **1. Precipitation variations 2. Wet years 3. Frankfurt a.M., Germany** —*E.Z.S.*

12.6–394 551.577.36(493.2):519.241.2

Sneyers, Raymond (*Inst. Ry. Met. de Belgique, Uccle, Belgium*), **On a special distribution of maximum values.** *Monthly Weather Review*, Wash., D. C., 88(2):66–69, Feb. **1960.** 2 figs., 2 tables, 4 refs., 8 eqs. **DWB, DLC**—The classical extreme-value theory does not give a good account of the distribution of maximum rainfall intensities in Belgium. Reasons are given for the use, in this case, of a probability function defined by a double exponential whose argument is a function represented by a curve with two asymptotes. The application of such a probability function, when the curve is a branch of a hyperbola, to the maximum rainfall, in 1 min., at Uccle, leads to a good fit. *Subject Headings:* **1. Rainfall intensity distribution 2. Probabilities 3. Belgium.**—*Author's abstract.*

12.6–395 551.509.318:551.515.8:551.577.37

§Raevskiĭ, A. N., **Issledovanie sluchaia vypadeniia intensivnykh osadkov v Stanislavskoĭ oblasti 12–13 iiunia 1957 g.** [Analysis of a case of intense precipitation in Stanislav Region on June 12–13, 1957.] *Kiev, Ukraine. Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, No. 17: 58–62, **1959.** 3 figs., 8 refs. **DWB** —This intense shower which began on the night of June 12, 1957 resulted in about 300 mm of rain and produced considerable damage. With the aid of the $AT_{850\ mb}$ map for the morning of June 12, 1957 and an aerological diagram, the author analyzes the synoptic situation associated with this intense rainfall. It is shown that this rainfall was produced by the passage of a marked cold front from the northwest, by a large atmospheric moisture content and by the intensification of the front under the influence of surface relief. *Subject Headings:* **1. Synoptic conditions for intense precipitation 2. Precipitation formation 2. Stanislav Region, U.S.S.R.**—*I.L.D.*

RAIN, SNOW AND HAIL (551.578)

See also: **Snow survey measurements, Calif.,** 12.6–35; **Sivadian's method of measuring raindrops** (Mészáros, Wirth), 12.6–249; **New method of recording water drops** (Rovinskiĭ), 12.6–250; **Radioactivity regime during passage of a cold front, Netherlands** (Bleichrodt), 12.6–314; **Regular decrease in albedo of a melting snow cover** (Kuznetsov), 12.6–341; **Variation of air and crustal temps. on Langjökull** (Ashwell, Hannell), 12.6–345; **Are snowdrifts along windbreaks a hazard?** (Kaiser), 12.6–359; **Scattering of saline drops near the seashore** (Kita, Aya); 12.6–363; **Ice formation on lead iodide single crystals** (Fukuta et al.), 12.6–374; **Nature and origin of ice nuclei** (Isono et al), 12.6–377; **Mean snowfall, Central and North Central, U. S.** (Asp), 12.6–405; **Hail climat., Illinois** (Huff, Changnon), 12.6–414.

12.6–396 537.3:551.578.11:551.574.1

†Goyer, G. G.; McDonald, J. E.; Baer, F. et al., **Effects of electric fields on water-droplet coalescence.** *Journal of Meteorology*, Boston, 17(4):442–445, Aug. **1960.** 2 figs., 2 tables, 15 refs. **DWB, DLC**—Growth of incipient precipitation particles by collision and coalescence with cloud droplets is one of the primary mechanisms of natural rain. Comparison of previous research shows wide divergence between various theoretical and laboratory values of collision efficiency and coalescence efficiency. In an effort to obtain additional laboratory measure-

ments of droplet coalescence, high-speed photographs were taken of colliding droplets at the breakup point in a Rayleigh jet. With 700-micron diam droplets, less than 30% of the collisions result in coalescence under no field condition. At fields of about 40 v per cm, the coalescence was about 100% under all conditions of field. *Subject Headings:* **1. Rain mechanism 2. Water-droplet coalescence 3. Electric field effects on droplets. I. Braham, R. R., Jr.**—*Authors' abstract.*

12.6–397 551.578.11

Mészáros, Ernő and Wirth, Endre, **Az esőcseppek nagyság szerinti eloszlásának egyenletei.** [Equations of raindrop size distribution.] *Időjárás*, Budapest, 63(4):241–243, July/Aug. **1959.** fig., 6 refs., 5 eqs. **DLC**—A review and evaluation of empirical equations to determine the spectrum of raindrops is presented. The basic problem in each case is to express the number of raindrops contained in a unit of volume as a function of radius or diameter. The first empirical function formulated by MARSHALL and PALMER in 1948 is shown to adequately describe the distribution in the region of small diameters. Equations of BEST, LEVIN, MUCHNIK, POLIAKOVA and SHIFRIN and LITVINOV are reviewed and the computed and measured distribution is shown by a diagram. *Subject Heading:* **1. Raindrop size distribution.**—*O.T.*

12.6–398 551.578.41(52)

*Fujiwara, M. (*Met. Research Institute*), **Preliminary investigation of snowflake size-distribution: a snowfall on 1st April 1956 in Japan.** *Papers in Meteorology and Geophysics*, Tokyo, 8(3):171–214, Oct. **1957.** 18 figs. (incl. photo), 5 tables, 48 refs., 13 eqs. English summary p. 202–206; Japanese summary p. 214. **DWB**—Analyses of the size distribution of flakes which fell in the Kanto District near Tokyo were made using meteorological and radar data. From the distributions of temperatures and phases of precipitation, it was found that the melting takes place at temperatures from 0°C to 3°C (Fig. 5). RHI radar reveals some particular motion of generation-cells of precipitation (Figs. 7 & 8) and on the warm frontal surface (Tab. 1). A convective cell of the frontal surface was formed in a shape similar to that of dynamic cumulus commonly seen in windy weather and by tracing contours of the echoes it was found that the maximum velocity of the up-current was about 5.5 m/s. The relationship between variation of the cut-off sizes of the spectrum and the air temperature on the ground was examined (Figs. 12–15) and compared with the observations made by MARSHALL and PALMER. Generally in snow, considering the relation between aggregate forms of snow and synoptic weather situations (Tab. 2), it was found that gravitational separation of small and large particles in the snow streaks was hardly observed contrary to the case of rain streaks. On the collision frequencies of snowflakes, simple theoretical estimations were made and investigated the ratios between snowflakes and raindrops for the same falling depth, which were 423-dry flakes, 126-rimed dendrite flakes. Finally some comments were made on the radar reflectivity of melting snowflakes $Z(=\Sigma ND^6)$ comparing with Rayleigh scattering method. It is concluded that the levels of the maximum echo enhanced in the melting layer may be clearly different when a different wave length was applied (Fig. 17 & 18). Tables of data on size distribution of snow aggregates; five different columns, observed time in JST, and exposed period in second, are added in Appendix. *Subject Headings:* **1. Snowflake size distribution 2. Kanto District, Japan.**—*K.C.*

12.6–399 551.578.41

*†Schulz, W., **Untersuchungen über das Wachstum der Eiskristalle.** [Investigations on the growth of ice crystals.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A* Vienna, 11(4):503–531, **1960.** 28 figs., 10 tables, 27 refs. German, English and French summaries p. 503–504. **DLC**—Condensation and sublimation processes have been examined on a dew-point mirror at low temperatures and vapour pressures. If the mirror is covered with a thin layer of zapon lacquer, different ice crystals according to the chosen conditions can be produced at temperatures between −14°C and −45°C in steam pressure ranges of 1.5 to 0.1 mm Hg. Microphotographs show the crystal forms and their growth. Since a special arrangement developed by us allows watching single crystals over longer periods, observations about the growth and its speed can be made which show that the final form of a crystal is determined by its early forms, provided that no dendrite growth occurs. The

speed of growth is between about 0.1 and 7.0 mm/h and its mean value seems to be characte istic for the special crystal forms. Some experiments as to the co-existence of the fluid a solid phase of water prove that the efficiency of the Bergeron-process in clouds is often ove rated. *Subject Heading:* **1. Ice crystal growth rate.**—*Author's abstract.*

12.6–400 551.578.46(74.75)(0

Ayer, Gordon R. (*Hydraul. Engineer, U. S. Geolog. Survey, Albany, N. Y.*), **History snow surveying in the East.** *Western Snow Conference,* April **1959,** *Proceedings,* 27:12 -1 Sept. **1959.** 3 refs. **DWB**—Snow surveying started in the eastern U. S. in 1914 at Somersc Vt. In 1836, the first report on snowfall was issued by the chief engineer of the Chenang Canal (New York). In 1903 another survey was made by the resident engineer of Rumfo Falls Power Co. According to him, the depth of snow on 17 March was 38 in. equal to 9.86 i of water. The hydroelectric generation system was the cause of one other snow survey in 191 It was anticipated that snow runoff from 30 sq mi of drainage would be desirable for its efficie operation. In the early twenties the system was further expanded and in 1926 bimonth determinations of water content were made. By 1942 there was sufficient record to determi any relationship between snow cover and total runoff. In the east, the snow surveys are mac in the Jan.–March period. *Subject Headings:* **1. Snow surveys 2. Snow cover-runoff relatio ships 3. Northeastern U. S.**—*A.K.*

12.6–401 551.578.71(4

Ludlam, F. H., **Hailstorm studies, 1958.** *Nubila,* Verona, Italy, 2(1):7–27, **1959.** 7 figs 2 refs. Italian summary p. 7–8.—Hailstorm studies in the vicinity of Verona began on 17 Jun and continued until 6 July 1959. Measurements of droplet spectra and concentration giant hydroscopic nuclei; visual observations of the distribution, size and growth rate of cumul clouds, as well as radar observations of echoes from cumulonimbus clouds were made. Th results of these observations are summarized and shown graphically. On the whole there is general agreement that in a severe storm the first precipitation to form is supercooled rai and that after its formation the cloud develops through a hail stage into a nature rain stag *Subject Headings:* **1. Hailstorm analysis 2. Verona, Italy.**—*N.N.*

HYDROMETEOROLOGY (551.579)

See also: **Yearly stream runoff distribution** (Andreianov), 11.6 9; **Practical hydrology** (Luchsheva), 12.6–11; **Course in met., hydrol, and hydrometry** (Leivikov), 12.6–14; **Arid zone hydrology** (Schoeller), 12.6–32; **Control of mudflows** (Mamedov), 12.6–33; **Aerial photography of inland water** (Popov), 12.6–34; **Snow survey measurements, Calif.,** 12.6–35; **Hodromet. service, U.S.S.R.** (Nekhotizeva), 12.6–73; **Participation of Ukrainian Hydromet. Sci. Res. Inst. in IGY** (Prikhot 'ko), 12.6–74; **Hydrologic terminology** (Spengler), 12.6–86; **Precip. and levels of Lakes Michigan and Huron** (Brunk), 12.6–241; **Classification of lakes according to water balance** (Bogoslovskiĭ), 12.6–243; **Water balance of Khrami reservoir** (Khalatian), 12.6–244; **Water balance, Lake Baikal** (Afanas'ev), 12.6–245; **Long-term storage in reservoirs** (Hurst), 12.6–247.

12.6–402 551.501:551.57

Kawabata, Y. (*Japan Met. Agency, Tokyo*), **On the sufficient number of rainfall station for small basins.** *Geophysical Magazine,* Tokyo, 29(4):509–512, March **1960.** fig., table **DWB, DLC**—To determine exactly the areal distribution of rainfall in a river basin and runo thereform, it is important to determine the number of rainfall stations sufficient for the purpos of the work. For this purpose we have made some sample investigations, cooperating wit the Japan Economic Stabilization Board. A semi-circular region surrounded by a radius c about 39 km around Takahagi City was chosen as a sampling area. This region faces th Pacific, and the western part of it extends to the mountainous region, the height of which i about 600–800 m, and the cyclones pass all around the region; hence the region was considere to be suitable as a sampling test. A small river runs through the middle part of the regio from west to east. *Subject Headings:* **1. Rainfall runoff investigations 2. Rainfall network 3. Japan.**—*Author's introduction.*

12.6-403 551.579.1/2:551.524.32(524)

Arakawa, H. and Tsutsumi, K. (*both, Met. Res. Inst., Tokyo*), **Integrated run-off and mean monthly air-temperature in the colder half of the year in northern Japan.** *Papers in Meteorology and Geophysics*, Tokyo, 10(1):34–37, Sept. **1959.** 3 figs., 2 tables. **DWB**—The integrated runoff and the mean temperature of Hokkaido and Tohoku districts are tabulated for Nov. through June from 1942 to 1956. The correlation coefficient as computed led to the conclusion that where there are enough snow deposits in the mountainous areas and when the air temperature is near or slightly above the freezing point, the runoff is almost proportional to the variation of the air temperature. But when the air temperature is well below or well above the freezing point, the runoff is not similarly proportional. *Subject Headings:* **1. Runoff data 2. Mean monthly air temperature data 3. Northern Japan.** *E.Z.S.*

12.6-404 551.579.4:551.577.37(684)

Young, B. S. (*Univ. of Natal, Pietermartizburg*), **Floods in Natal.** *Weather*, London, 15(3):92–97, March **1960.** 4 figs. **DWB** -Describes the serious floods of May 1959 in Natal, South Africa. These rains were caused by southerly winds which brought air with a freezing level at 7000 ft. There was a 24 hour rain on 16 May with coastal areas recording 1.00 in. and the interior 0.5 in. of rain. The maximum temperature fell a few degrees along the coast and as much as 10° in the interior. On the 17th and 18th of May there was a heavy rainfall of 6.2 in. The winter weather returned after scattered rains. *Subject Headings:* **1. Flood chronologies 2. Natal, South Africa.**—*A.H.K.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY (551.58)

See: **Climat. at work** (Barger, Nyhan), 12.6–23; **Changing climate, past and present.** (Lamb), 12.6–417.

CLIMATE OF PARTICULAR PLACES (551.582)

See also: **Finland and its geog.** (Platt), 12.6–17; **Lebanon: study of physical geog.** (Vaumas), 12.6–19; **Climate, Tatar Republic** (Smoliakov), 12.6–22; **Climate, Potsdam** (Böer), 12.6–30; **Prevailing winds, Atlantic Ocean** (Markgraf), 12.6–47; **Climate of Russia** (Popova), 12.6–80; **Bibliog. of climate of Caucasus** (Zikeev), 12.6–85; **Climat. data summaries, Canada,** 12.6–262; **Met. microclimat. obs., Valdivia** (Kunkel), 12.6–264.

12.6-405 551.582:551.578.42(74,76,77)

Asp, M. Oliver (*U. S. W. B., Kansas, Mo.*), **Mean snowfall in Central and North Central United States.** *U. S. Weather Bureau, Weekly Weather and Crop Bulletin*, 45(49):7–8, Dec. 8, **1958.** fig., table. **DWB, DLC**—The mean monthly and seasonal snowfall are given for the climatological divisions in 12 states in the Central and North Central U. S. The values on the map are based on all stations having 25 yrs of weather record (1931–1955). The amount of snowfall varies from state to state and increases from south to north. Nov. through March is usually the season of greatest snowfall. In Jan. 1949 the Black Hills of South Dakota recorded 49.9 in. Over 40 in. of snowfall in a month have also been recorded for a number of times in Upper Michigan. Although Kansas City, Mo., usually receives less than 20 in. a yr, it had 67 in. during the 1911–12 season and in March 1912 it fell to 40.2 in. *Subject Headings:* **1. Snowfall data 2. Climate of United States 3. Central United States 4. North Central United States.**—*N.N.*

12.6-406 551.582(456.3):79:061.3

*Coccia, Luigi, **Il clima estivo di Roma, con particolare riferimento al periodo delle Olimpiadi.** [Summer climate of Rome, with special reference to the period of the Olympic games.] *Rivista di Meteorologia Aeronautica*, Rome, 19(4):3–36, Oct./Dec. **1959.** 18 figs., 20 tables, 18 refs. Italian, French, English and German summaries p. 3. **DLC**—Using the

meteorological data obtained at the Campino meteorological station during 1949–1958, th author examines the characteristics of the Roman summer climate with particular reference t the period covering the last decade of Aug. and the first 15 days of Sept. when the Olympi Games of 1960 were to take place. With the aid of extensive data, there is presented a discus sion of the variation of atmospheric temperature, wind velocity and direction, relative humidity precipitation cloud cover and visibility for the months of June, July, Aug. and Sept. On th basis of a study of the dynamic climatology of the Mediterranean basin (M. Urbani) in whic the summer weather conditions are classified into 7 families of climatic types, the autho classifies the weather situations of Rome into four main families where pressure situations ar presented. These weather types are described and their monthly frequency and their duration are given. The description and analysis of the weather elements by decades during th Olympic Games period (Aug. 21–Sept. 11) is presented. *Subject Headings:* **1. Summer climate 2. Dynamic climatology of Mediterranean Basin 3. Weather types 4. Rome, Italy.**—*I.L.D.*

12.6–407 551.582(74) 551.584.4:633.2

*Pennsylvania. Agricultural Experiment Station, **Forage climates in the Northeast.** Its *Bulletin*, No. 653, June 1959. 33 p. 33 figs., 4 tables. **DWB** (M86:633 P415fo)—General climatic data were gathered at cooperating stations in nine states of the Northeast; air temperature in the microclimates were measured at six stations, and at six locations soil temperatures were determined at five depths beneath grass sod. *Moisture:* Extremes of precipitation above and below the long-term averages for the growing season occurred in all locations except in New York. Widest extremes occurred in Connecticut and Rhode Island. In Maryland and New Jersey rainfall was below normal three of the four years. While variations between months within years frequently were great, in some states rainfall was consistently above or below normal in certain months in all four years. Dew on vegetation was more frequent during certain months at several stations (Rhode Island) and was least frequent at others (New Jersey). Soil moisture frequently limited growth, particularly in 1955 and 1957, but in 1956 soil moisture did not limit growth at most locations. *Air Temperature:* Comparisons indicate that in some years air temperatures were above or below normal in certain months at all stations. In other years and in certain months, air temperatures at some stations were below normal whereas at others they were normal or appreciably above. Mean air temperatures at the 3-in. height (microclimate) were generally higher than at the 60-in. height during summer months. Daily maximum to minimum temperature ranges were much greater in the microclimate at several stations and particularly during midsummer. Relative temperatures, 60 inches being used as the zero point, indicated generally greater maxima in the microclimate during summer months. Minima at 3 inches were relatively lower than at 60 inches. *Soil Temperature:* At 1-in. soil depth monthly averages of daily temperatures indicated a range of 20 degrees from the maximum to minimum. This range decreased to 2 or 3 degrees at 16 in. Mean temperatures for all depths were similar in March and Sept. As summer approached, mean soil temperatures increased first near the surface. As fall and winter approached, mean temperatures near the surface were first to decrease. For this reason, at greater depths soil temperatures compared with those nearer the surface tended to be higher in the winter and lower during the summer. *Subject Headings:* **1. Climate data of Northeastern U. S. 2. Northeastern U. S.**—*Author's abstract.*

12.6–408 551.582(85) 551.586:551.45

West, Robert C., **Utilization of the Peruvian coastal desert.** *Geographical Review*, N. Y., 49(4):569–570, Oct. 1959. **DWB, DLC**—The author reviews several reports on the activities of the Instituto de la Zona Árida Peruana, established in 1956 by UNESCO Advisory Committee on Arid Zone Research, that have been published by Gonzalo de Reparaz (**La zone aride du Pérou,** *Geografiska Anneler*, 40:1–62, 1958 and **El programa de estudios de la zona arida peruana,** Lima, 1958). Climatological investigations show that insolation and cloudiness are highly variable along the coast. The cloudiest part is a 500 mile stretch centered on Lima, which forms a "humid" desert. The northern and southern parts of the coast, with less fogginess, show the more normal desert conditions of intense sunshine and high rate of evaporation. Micrometeorological studies have been made of the lomas vegetation belt in the Andean foothills north and south of Lima to determine the possibilities for dry farming. Significant

studies on the hydrology of the river basin of the arid coastal zone have been prepared. Some of the larger streams are intermittent, dependent on seasonal mountain rains; others are more nearly perennial, fed by mountain rains, melting snows and glacial meltwater. Soil chemistry ecology of desert flora and desert geomorphology are other interrelated topics the institute is investigating along the Peruvian coast. *Subject Headings:* **1. Coastal desert 2. Coastal climate 3. Peru.**—*I.L.D.*

12.6–409 551.582.1(795)

†Decker, Fred. W., **The weather of Oregon.** *Oregon. State College, Corvallis, Science Series,* No. 2, June **1960.** 40 p. 10 figs., photos, charts. Bibliog. in Appendix. **DWB**—In this popular pamphlet the author first describes the various factors which condition Oregon's weather. Other chapters give an account of variations of weather and climate within the state, services provided by the U. S. W. B. and the universities in Oregon, weather and Oregon's forests, weather and agriculture, and industrial meteorology. An appendix gives a long list of additional references on the subject. Photos show meteorological personnel engaged in activities of various types throughout the state. *Subject Headings:* **1. Climate of Oregon 2. Weather in Oregon 3. Oregon.**—*A.H.K.*

12.6–410 551.582.1(677)

Fantoli, Amilcare, **Alcuni elementi relativi alla climatologia della Somalia.** [Certain elements of the climatology of Somaliland.] *Rivista di Meteorologia Aeronautica,* Rome 20(2):3–21, April/June **1960.** 14 figs., tables, refs. Italian, French, English and German summaries p. 3. **DLC**—After a short survey of the organization of weather services in Somaliland, and of data collected, general information is given concerning the climate of that country, the latter being drawn from a study on this topic that is being completed. In particular, the author points out the factors that are especially responsible for the relative uniformity of the local climate, and for the attenuation of thermic peaks, and also the general distribution of rainfall. *Subject Headings:* **1. Climate of Somaliland 2. Weather services 3. Somaliland.** —*Author's abstract.*

12.6–411 551.582.1(6):62:001.6

Oppermann, Herwarth, **Klimatische Voraussetzungen für die Technisierung Afrikas.** [Climatic conditions for the technological development of Africa.] *Naturwissenschaftliche Rundschau,* Stuttgart, 12(4):138–140, April **1959.** fig., table. **DLC**—A general survey of the climatic conditions is given and includes a precipitation map. Tabulations of 24 main locations present their respective geographical position, warmest, coldest, driest and wettest months as based upon long period records of 30 weather stations. Timbuktu shows the hottest and driest month: 34.7°C and 3.0 g/m³ humidity; Togo shows the most humid month: 23.3 g/m³. *Subject Headings:* **1. Climate of Africa 2. Africa.**—*W.N.*

12.6–412 551.582.2/3(791)

*Jurwitz, Louis R. and Kangieser, Paul C. (*both, W. B. State Climatologists*), **Climates of the states: Arizona.** *U. S. Weather Bureau, Climatology of the United States* No. 60-2, Sept. **1959.** 14 p. maps, tables, 6 refs. **DLC, DWB**—A publication containing information on the climate of Arizona. The topography, characteristic geographical features of the state and the weather are briefly described. Weather data is also tabulated and shown in maps. Freeze data gathered from 46 stations for 1921–1950 are tabulated. The mean temperature and precipitation and normals, means and extremes are also tabulated. The maps show mean annual precipitation (1931–1955) and mean maximum and minimum temperature for Jan. and July (1931–52). A map of Arizona is appended. *Subject Headings:* **1. Weather data 2. Climate of Arizona 3. Arizona.**—*I.S.*

12.6–413 551.582.2(71)

*Boughner, C. C. and Thomas, M. K., **The climate of Canada.** Reprinted from *the Canada Year Book 1959 and 1960* [issued by] Information Services Div., Dominion Bureau of Statistics, Ottawa. Distributed by the Meteorological Branch of Canada. 74 p. 4 charts, numerous tables, 12 refs. **DWB** (M82.1/71 C212ca)—A description of the basic climatic features and

the various climatic regions of the country and a detailed study of the provincial and territorial climates. A discussion of climatic controls is included. Abundant data is given. The tables consist of monthly temperature and precipitation data along with supplementary data on humidity, wind, sunshine, etc. Tables are shown for many of the well-known cities and for locations representative of large sparsely-populated areas. *Subject Headings:* **1. Climatic data 2. Weather data 3. Climate of Canada 4. Canada.**—*E.Z.S.*

12.6–414 551.582.2:551.578.7(773)

*Huff, F. A. and Changnon, S. A., Jr., **Hail climatology of Illinois.** *Illinois. State Water Survey, Report of Investigation* 38, **1959.** 46 p. 35 figs., 8 tables, 10 refs. **DLC**—The report is devoted primarily to presentation of extensive statistical analyses of the daily, monthly, seasonal, and annual distribution of hail in the state. However, some consideration has been given to physical factors affecting hail distribution and to the association of rainfall and other synoptic weather features with hailstorms. Relation of hail to elevation is considered. In the high plains it has been found that hail frequency increases with elevation. A summary contains interpretations of the data with conclusions explaining the distribution throughout the year and throughout the geographic area. *Subject Headings:* **1. Hail distribution 2. Hail statistics 3. Illinois.**—*E.Z.S.*

12.6–415 551.582.2(436)

*Lauscher, Friedrich, **Beiträge zur Kenntnis des Klimas von Linz.** [Contribution to the knowledge of the climate of Linz.] *Wetter und Leben*, Vienna, Sonderheft, No. 6:175–195, **1959.** 15 figs., 20 tables. **DLC**—After a discussion of the concepts of weather, fair weather, bad weather and climate the author examines the climate of Linz. The paper includes the following: the position of Linz in the system of world climates; climatic profiles in the Danube Valley from its source to Hainburg; the climatic differences between the Danube Valley and the adjacent mountain country of the Mühlviertel, cloud conditions in the Austrian Danube valley and the adjoining landscapes, comparison of the city climate of Linz (Museum street) with the open country (Hörsching Air Field) and climatic tables for Linz for 1796–1833, 1852–1900, and 1901–1956. *Subject Headings:* **1. Climate of Linz 2. Danube Valley 3. Linz Austria.**—*I.L.D.*

12.6–416 551.582.2(53):625

McLoughlin, Anthony, **The Hejaz Railroad.** *Geographical Journal*, London, 124(2):228–283, June **1958.** map. **Comment by** H. St. J. B. Philby, *Ibid.*, 124(4):588–589, Dec. **1958. DLC**—Brief note on climate of Hejaz is appended to a short summary of an article deposited in library on the railroad constructed by the Germans, in 1901–08 to carry piligrims from Damascus to Mecca. It runs 710 km through inner Arabia, with beautiful stone stations every 20–30 km. A road for trucks or autos parallels the deteriorating railroad. Rain occurs only during late Dec. Temperatures range from 35°F to 140°F, according to the author, but Philby says that rain occurs at any time between mid-Oct. and mid-April and that maxima are 100° to 108½°F (sun temp., 127½°F in late June) and never over 120° in Arabia in 40 yrs. *Subject Headings:* **1. Climate of Hejaz, Arabia 2. Hejaz Railroad 3. Arabia.**—*M.R.*

CLIMATIC CHANGES (551.583)

See also: **The Pleistocene period** (Zeuner), 12.6–20; **Paleohydrological regime of Lithuanian lakes** (Garunkshtis), 12.6 214; **Late Pleistocene environments, Laguna de San Rafael area, Chile** (Heusser), 12.6–215; **Temp. fluctuations, British Columbia Coast** (Crowe), 12.6–346.

12.6–417 551.583 551.58:001.1

Lamb, H. H. (*Met. Office, Harrow*), **Our changing climate, past and present.** *Weather*, London, 14(10):299–318, Oct. **1959.** 9 figs., 3 tables, 15 refs. **DWB**—An interesting paper discussing the subject of climatic change, delivered on March 4, 1959. The paper includes numerous tables, graphical representations, and photographs which illustrate the discussion. The new concept of a changing climate is compared with the concept of static climate, popular

until the World War II. The new concept is based on the idea that all elements and aspects of the climate of a place under consideration at any time are habitually related to the same years. After the introductory discussion a historical survey of the changing pattern of climate, supporting the concept of climatic change, is presented. For a better understanding of climatic change, the need for an intensive study of the general circulation of the atmosphere and oceans and of the changing influence upon them exerted by external agencies is emphasized. *Subject Heading:* **1. Climatic changes.**—*I.S.*

121.6–418 551.583.13:551.524.32(439.1).

Berkes, Z., **A weather-period of great persistence.** *Időjárás*, Budapest, 63(4):193–198 July/Aug. **1959.** 2 figs., table, 3 refs., eq. German summary p. 193; Hungarian summary p. 198. **DLC**—A period of 4.09 years was found to occur persistently in the changes of the monthly temperature means of Jan. Feb. in a series of 180 years at Budapest (Table 1). The amplitude of the period amounts to 2.3°C oscillating between 1.9 and 2.4°C in relation to the average values of 45 years (Figs. 1 and 2). The most severe part of the winter will be shifted with regularity to the last winter-month, parallel to the delayed occurrence of Scandinavian anticyclones. The maximum of the amplitude of the period appears in the region of Kieol (Fig. 2). *Subject Headings:* **1. Weather periodicities 2. Temperature periodicities 3. Budapest, Hungary.**—*Transl. of German summary (O.T.).*

12.6–419 551.583.13:551.509.335

Buell, C. Eugene (*Kaman Aircraft Corp., Albuquerque, N. Mex.*), **Meaning of combined climate and persistence forecasts.** *Journal of Meteorology*, Boston, 15(6):564–565, Dec. **1958.** 3 figs., ref., 3 eqs. **DWB, DLC** –The author reviews some of the ideas stated by A. Kochanski (*Amer. Met. Soc., Bull.*, 38:601–607, 1937) that a linear combination of a climate forecast and a persistence forecast is on the average better than either alone. This combination process is interpreted geometrically and it is shown that the best linear combination of a climate forecast and persistence forecast is the statistical forecast. The statement "the best linear combination of climate and persistence" and the statement "least square estimate" or statistical forecast are fundamentally identical. *Subject Headings:* **1. Climate forecasts 2. Persistence forecasts 3. Statistical forecast.**—*I.L.D.*

12.6–420 551.583.14:551.586:616

Picko, Václav, **O meteorotropismu singularit.** [Meteorotropism of singularities.] *Meteorologické Zprávy*, Prague, 12(1):15–21, 1959. 11 figs., 2 tables, 32 refs., eqs. Russian and German summaries p. 15–16. **DWB, DLC**—Meteorotropism is the connection of climatological and meteorological elements with illnesses. A statistical study has shown that secular cycles are without influence on the human body's disposition to illnesses, while rapid short-term singularities, even if they come in regular periods (calendar singularities) create conditions for increased disposition to illness in the human body. *Subject Headings:* **1. Weather sensitivity 2. Singularities 3. Periodicities 4. Climate and health.**—*J. Němec.*

12.6–421 551.583.15:551.513

Antipov, N. P., **Ob izmenenii klimaticheskikh elementov v Vologodskoĭ oblasti za poslednie gody.** [Change in the climatic elements in the Vologda Region during recent years.] *Vologodskiĭ Kraĭ*, Vologda, No. 1:107–124, **1959.** 3 figs., charts. **DWB** (914.72 V929vo)—Temperature and precipitation data for 1944 to 1957 for 4 stations in the Vologda Region (Vytegra, Babaevo, Tot'ma and Veliki Ustyug) for winter and summer are tabulated, compared with normal and the results analyzed and shown graphically. It is concluded that allowing for variations due to topography, the winters are warmer than normal, the coldest month has shifted from January to February (even in the mean for 13 years) and occasionally to March; summers are noticeably cooler; autumn warmer than the long period mean; precipitation heavier and cloudiness and relative humidity greater than normal. Cause is tied up with an increase in circulation from the Atlantic or a decrease in continentality. Graphs and tables indicate considerable year-to-year variation as well as the above overall changes, of importance to agriculture and other human activities. *Subject Headings:* **1. Climatic changes in Vologda Region 2. Vologda Region, European U.S.S.R.**—*M.R.*

12.6–422 551.583.3/7:551.521.3

Öpik, E. J., **Solar variability and palaeoclimatic changes.** *Irish Astronomical Journal*, Armagh, 5(4):97–109, Dec. **1958.** 3 tables, 7 refs. **DLC.** Reprinted as Armagh Observatory Leaflet, No. 49. **DWB**—Although no one could at present pretend to have discovered the time cause of the climatic variations, and the ice ages in particular, the variability of the sun's radiation is most probably the main cause; this theory is strengthened by the fact that a mechanism responsible for the variability, leading to repeated changes of the required amount and time scale, can be actually described. The mechanism comes necessarily into play and will produce the major observed effects on one condition that the sun's core contains not less than about 2–3% of elements heavier than hydrogen and helium. Such a content of the heavier elements is highly probable because it conforms to the supposed mode of origin of the stars from diffuse matter of interstellar space, and to the observed composition of this matter. The present paper gives an account of how the processes taking place in the interior of a star outwardly similar to our sun, must inevitably lead to variations in radiation over millions of centuries, of a kind which can explain the observed changes in terrestrial climate. *Subject Headings:* **1. Solar radiation variations 2. Climatic change theories 3. Paleoclimates.**—*I.S.*

12.6–423 551.583.3:551.336/.7

†Kats, N. Ia., **O klimate lednikovykh epokh v sviazi s voprosom razvitiia oledeneniĭ.** [Climate of glacial epochs.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Leningrad, Izvestiia*, 92(1):5–15, Jan./Feb. **1960.** 2 figs., 54 refs. **DWB, DLC**—The paper deals with the humidity of the climate in the periglacial zone of the last glaciation in plains of the Northern Hemisphere on the basis of paleobotanic data and juxtaposition with contemporary climatic elements, as well as with the boundaries of certain plant formations. The influence of glaciation itself upon the climate was taken into consideration, and the author dwells on climatic conditions of the period of origin and development of glacial covers when the centers of glaciation were being formed. *Subject Headings:* **1. Periglacial climates 2. Paleobotanic data 3. Glacial climates 4. Northern Hemisphere.**—*A.M.P.*

12.6–424 551.583.3:551.46(262.9)

Shnitnikov, A. V., **Proshloe i budushchee Arala s pozitsiĭ bol'shikh ritmov klimata.** [Past and future of the Aral Sea from the point of view of large climatic rhythms.] *Vsesoiuznyĭ Gidrologicheskiĭ S"ezd, Trudy [of 3rd Conference, Oct. 1957]*, Vol. 7, issued **1959.** p. 47–57. 3 figs., 14 refs. **DWB** (M79 V985tr)—A large climatical cycle of 2000 yrs of dry-humid variations in the Northern Hemisphere manifests itself in the basin of Aral Sea and Amu Darya and Syr Darya Rivers. Examination of available data leads to the conclusion that in past 4,000–4,500 yrs, the now dry Sar"yikamish depression and the dry Uzboy River, were filled with water three times. All three fillings coincide with cold and humid phases of the 2000 yr cycle. Two maps of the basin and a chart of cyclic variation illustrate the report. *Subject Headings:* **1. Climatic cycles 2. Aral Sea, Asiatic U.S.S.R.**—*J. Němec.*

MICROCLIMATOLOGY (551.584)

See also: **Internal temp. of 1959 Alpha** (Simas et al.), 12.6–107; **Microclimate of drained swamps, Lithuania** (Dorfman), 12.6–108; **Microclimate of rice fields, Kopancs** (Wagner), 12.6–109; **Effect of plastic screens on vines** (Primault), 12.6–110; **Climate of deciduous forests** (Heckert), 12.6–111; **Room temp. in winter and summer** (Gäbelein et al.), 12.6–120; **Investigation of heat and water balance, Centerton** (Mather, Hacia), 12.6–280; **Forest climates in the Northeast,** 12.6–407.

12.6–425 551.584.3:551.525.2:551.311.31

Nakagawa, Y. (*Natl. Inst. of Agric. Sciences*), **Microclimatological characteristics in the dune.** *Journal of Agricultural Meteorology*, Tokyo, 15(3):97–101, Jan. **1960.** fig., 4 tables, 6 refs., 27 eqs. In Japanese; English summary p. 101. **DWB**—It is known that the surface soil temperature in a dune shows marked increase in the daytime. In order to obtain the reason for this, the author carried out observations of vertical distributions of soil temperature, air temperature, humidity, wind velocity and solar radiation in Aug. at Skata, Yamagata

Pref. The results are as follows: (1) The marked increase of surface soil temperature in the dune depends mainly on decrease of thermal conductivity (heat conductivity) of the soil, especially in surface layer, lower value of heat capacity of that and the increase of heat flux to the soil introducing by decrease of heat loss by evaporation. (2) It was recognized that the surface soil temperature in the dune can be computed from meteorological data by using formula (24) and (27) as shown in Table 4. *Subject Headings:* **1. Microclimate of sand dunes 2. Soil temperatures 3. Heat balance in sand dunes 4. Yamagata Prefecture, Japan.**—*Author's abstract.*

12.6–426 551.584.3(234.42:497.1)

Pašić, Hamid, **Kleinklimatische Messungen im Massiv der Bjelašnica/Jugoslawien.** [Microclimatic measurements made in the Bjelasnica mountain range, Yugoslavia.] *Germany. Deutscher Wetterdienst, Berichte,* 8(54):62–67, **1959.** 11 figs., 3 tables, 11 refs. German and French summaries p. 62. **DWB, DLC**—During 1954–1955 the author carried out microclimatic observations in the Bjelasnica Mountains which together with the range form a barrier against the farther penetration of Mediterranean climatic influences into the continent. Observations were carried out simultaneously at seven points for seven day periods in every season during the 8 daily synoptic periods. Temperature was measured at 0, 5, 10, 50 and 100 cm levels and relative humidity at 10, 100 and 200 cm. Graphs showing the temperature variation in summer for the different stations and tables giving data on the mean temperatures and the maximum and minimum temperatures during observation period for each station are presented. The results indicate that the northern slope of the range is somewhat cooler and that the range together with its ridge separate the Mediterranean from the continental climatic region. The distribution of precipitation is irregular and depends upon synoptic conditions. The southerly winds are considerably stronger than the northerly winds and in the case of cyclones aloft with centers over Africa these occur especially in summer, very dry high altitude winds, which are observed also in Nov. Accordingly evaporation and desiccation of soil is more intense on the southern slope so that the vegetation of this slope is sparse. *Subject Headings:* **1. Microclimatological observations 2. Bjelasnica Mts., Yugoslavia.**—*I.L.D.*

12.6–427 551.584.34:551.326.62

Larsson, Peter, **Studies of micrometeorology at Fletcher's Ice Island, T-3.** *U. S. Air Force. Cambridge Research Center, GRD Research Notes,* No. 29, Dec. **1959.** p. 26–31. 3 figs. **DWB**—An intensified air-temperature gradient sounding program in which measurements reached in some cases to 1000 ft. Measurements were made of incoming and outgoing short wave radiation and incoming total radiation, over differing ice types and water surfaces, ablation and ice temperatures. Some humidity measurements were taken but humidity gradients could not be determined. Wind speed probes at various heights gave good results. *Subject Headings:* **1. Micrometeorology of Fletcher's Ice Island 2. Temperature gradient in Arctic 3. Arctic Ice Island (T-3) 4. Arctic.**—*E.Z.S.*

12.6–428 551.584.34:551.324.28

Lotz, James R., **Ellesmere Island Ice Shelf meteorological program.** *U. S. Air Force. Cambridge Research Center, GRD Research Notes,* No. 29, Dec. **1959.** p. 87–91. 3 figs. **DWB**—A brief outline of the meteorological and micrometeorological work carried out during summer of 1959, emphasizing the establishment and running of stations, some problems involved, and suggestions for the 1960 program. Photographs of instruments in place are shown. *Subject Headings:* **1. Ice shelf meteorological programs 2. Micrometeorological observations 3. Ellesmere Island, Canada.**—*E.Z.S.*

12.6–429 551.584.41/2 551.586:633.71

*Waggoner, Paul E.; Pack, A. Boyd and Reifsnyder, William E., **The climate of shade: a tobacco tent and a forest stand compared to open fields.** *Connecticut. Agricultural Experiment Station, New Haven, Bulletin,* No. 626, Dec. **1959.** 39 p. 7 figs., 12 tables, 20 refs., eqs. —An experimental study of the microclimate within the tobacco shade tent under which the special tobacco leaves for wrapping cigars are grown. The contents of this study comprise the following: history of tobacco shade tent, quality of leaves grown beneath a tent, and

construction of the tent; the characteristics of the tent which was used in the experiment and the weather of 1957, and the tent of 1946, and the weather of the same year; total radiation in the tent over bare soil, transmission of short wave radiation by the tent, short wave radiation within the tent and the difference between the effect of the tent upon total and short wave radiation; extent of warming of the soil within the tent through radiation; air and soil temperature; humidity in the tent over the soil and over the tobacco plant, wind speeds in an empty tent and over tobacco plants in a tent; energy budget and energy available for evaporation; partitioning of energy between heat loss to the air and loss of heat to evaporation in an empty tent and evapotranspiration; human comfort within the tent; the tent as a model of a forest as indicated by the energy budget of a forest; transmission of radiation through the forest canopy and air and soil temperature. The relevant equation for computing radiation evapotranspiration, human comfort, and the results of measurements are presented. *Subject Headings:* **1. Microclimatological research 2. Forests 3. Tobacco shading 4. Microclimates of open fields.**—*I.L.D.*

CLIMATIC CLASSIFICATION (551.585)

See also: **Arid zone hydrology** (Schoeller), 12.6-32; **Physiographical conditions in virgin and waste lands of Kustanai Steppes** (Doskach, Fel'dman), 12.6–112.

12.6–430 551.585(474.5)

Kaushila, K. A., **O klimaticheskom raĭonirovanii territorii Litovskoĭ SSR.** [Climatic regions of Lithuania.] *Vseoiuznoe Geograficheskoe Obshchestvo, Leningrad Izvestiia*, 92(1):63–66, Jan./Feb. **1960.** 11 refs. **DWB, DLC**—The author presents a general and brief description of the main climatic differences and their causes, which provide the basis for the division of Lithuania into four climatic regions. The author adds that a detailed study of the climate will be made in the near future. *Subject Headings:* **1. Climatic classification 2. Climate of Lithuania 3. Lithuanian S.S.R.**—*A.M.P.*

12.6–431 551.585(86)

†Uribe A., Hernan, **La zonificación climatológica de Colombia.** [Climatic regions of Colombia.] *Cenicafe*, Chinchina, Colombia, 10(8):287–288, Aug. **1959. DPU.** Also: Trojer Hans, **Fundamentos para una zonificacion meteorologica y climatologica del tropico y especialmente de Colombia.** [Bases for meteorological and climatic regions of the tropics, and especially of Colombia.] *Ibid.*, 10(8):289–373, Aug. **1959.** 30 refs. 7 folded maps. Spanish summary p. 364–367, English summary p. 368–371.—Agricultural needs made it necessary to establish the meteorological and climatic regions of Colombia on the basis of global climatology, as influenced by local orographic conditions, and by applying the results of observations of the meteorologic network of Colombia. Pressure, temperature, density, humidity during ascension influence the local and regional weather phenomena. The climatological annual sequence is due to the position of the Intertropical Circulation System, while the topographical conditions influence daily circulation. The rainfall maps demonstrate the regional differences. The preliminary zonification of Colombia, according to the general weather sequence, consists of the coast zone of the Atlantic Ocean (basin of Maracaibo, Llanos Orientales) northern interior zone; central northerly zone; central southerly zone; southern Andine zone and southern zone. The characteristic features of above zones are presented in the course of the seasons. Maps, tables and diagrams illustrating the results of observations, elucidate and support the aim of the study of regional climatic division of Colombia. *Subject Headings:* **1. Climatic classification 2. Tropical climates 3. Climatic data 4. Climate of Colombia 5. Colombia.**—*O.T.*

12.6–432 551.585(47)

Zubenok, L. I.; Efimova, N. A. and Mukhenberg, V. V., **Materialy k klimatologicheskomu raĭonirovaniiu SSSR.** [Data for the division of the U.S.S.R. into climatic regions.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 76:98–112, **1958.** 11 figs., 2 tables, 16 refs., eq. **DWB**—The procedures and material for the climatic classification of the U.S.S.R., which is being carried out under the direction of M. I. Budyko, are presented. The indications

for the thermal and moisture conditions upon which the classification is based, are the thermal characteristics of the warm and cold periods and the humidification conditions. The thermal conditions of the warm period are characterized by the temperature of the active surface during the growing period. The temperature of the active surface, θ_w, and of the atmosphere, θ, are determined by the formula $\theta_w - \theta = (R_0 - LE - A/\rho D c_p + 4s\partial\theta^3)$ where ρ = air density, D = coefficient of outward diffusion for the warm season, c_p = specific heat of the atmosphere at constant pressure, s = coefficient characterizing the properties of the radiating surface, σ = Stefan Boltzmann coefficient, R_0 = radiation balance, LE = heat loss through evaporation and A = heat exchange in the soil. The winter period is characterized by the sum of negative temperatures. The sum of negative temperatures for the months was determined by multiplying the mean monthly temperature by the number of days per month. The relationship between the sum of negative temperatures and depth of seasonal freezing of soil is given by $h_0 = K_1\sqrt{\epsilon(-t)}$ where K_1 = coefficient depending upon local conditions. The humidification of the land surface is characterized by the index of aridity (inverse of the Dokuchaev-Vysotskiĭ index) representing the ratio of annual potential evaporation from the surface of the earth to annual precipitation. Data on the differences between monthly temperatures of the underlying surface and of the atmosphere and maps showing isolines of the temperature sums of the underlying surface during the growing season, the relationship between temperature sums of the underlying surface and sums of air temperatures, sums of negative air temperatures, index of aridity, and evaporation in Cm/month for individual months are presented. *Subject Headings:* **1. Climatic classification 2. Climatic data 3. Climate of U.S.S.R. 4. U.S.S.R.**—*I.L.D.*

BIOCLIMATOLOGY (551.586)

See also: **Xylem layers of trees as related to weather** (Daubenmire), 12.6–113; **Problems in bioclimat.** (Dubos), 12.6–114; **Seasonal variations in body weight of 100,000 newborn children** (Noack, Otto), 12.6–115; **Climatic origin of disease** (Sargent), 12.6–116; **Weather effects on man** (Undt), 12.6–117; **Climatic discomfort, Kimberleys** (Gaffney), 12.6–118; **Influence of met. factors on insomnia** (Svorad, Wellnerová), 12.6–119; **Contribution of municipal statistics to res. in medical met.** (Undt), 12.6 122; **Utilization of Peruvian coastal desert** (West), 12.6-408; **Meteorotropism of singularities** (Picko), 12.6–420; **Climate of shade** (Waggoner et al.), 12.6–429.

12.6–433 551.586:615.834(494)

†Mörikofer, W. (*Davos*), **Gesichtspunkte zur Klassifikation der Klimakurorte.** [Aspects of the classification of climatic health resorts.] Reprint from *Schweizerische Gesellschaft für Balneologie und Klimatologie, Annalen*, No. 44/45:45–64, **1955/1956.** 14 refs. **DWB** (M86:615.8 M694ge) - In connection with the results of a special official study on the climatic health resorts of Switzerland carried out in 1953, the author considers in detail the entire aspect of climatic health resorts in order to establish an objective basis for representing the climatic characteristics of climatic health resorts and to determine their therapeutic values. The contents of this study include the following: an analysis of the concept of the climatic "health resort," definition of the concept climatic health resort as established by the Swiss Working Group for Climatic Problems including such climatic therapeutic factors as stimulating factors, moderating factors (protection against strong winds, moderate or even cooling etc.) climatic conditions must be investigated by qualified medical personnel, well built housing etc.; the elements and factors of a health resort climate including insulation and radiation conditions, heat conditions, humidity and precipitation conditions, composition of the atmosphere, height above sea level and position on the landscape, observational basis of health resort climatology and assessment of climatic health resorts. *Subject Headings:* **1. Health resort 2. Resort climates 3. Switzerland.**—*I.L.D.*

12.6–434 551.586:615.834(477)

*†Belen'kiĭ, Moiseĭ Samoilovich; Turko, Boris Pavlovich and Shpil'berg, Grigoriĭ Ivanovich, **Zdravnitsy odesskogo kurortnogo raĭona.** [Sanitariums of the Odessa health resort region.] Kiev, Gosudarstvennoe Meditsinskoe Izdatel'stvo, UKSSR, **1957.** 94 p. 8 figs., 9 tables, 21 refs. **DLC** (RA878.03B4) - On p. 11–14 the general climatic conditions of the Odessa resort

area are outlined with mean monthly and annual temp. and precip. data, hours of sunshine for Piatogorsk, Kislovodsk, Sochi, Yalta and Odessa, snow, frontal activity, etc. The remainder of the Bulletin gives data and description, with photos, of the several health resorts in the area. *Subject Headings:* **1. Health resorts 2. Resort climatics 3. Odessa, U.S.S.R.**—*M.R.*

12.6–435 551.586:615.834

*Wagner, H. (*Bioklimatische Forschungsstation, Bad Elster*), **Die Beeinflussung des Organismus im Kurort unter dem Einfluss biologischer Jahreszeiten.** [Influences of biological seasons on the organism of health resort patients.] *Zeitschrift für Meteorologie*, Berlin, 13(1/6): 95–100, Jan./June **1959.** 2 figs., 5 tables, 3 refs. German and English summaries p. 95.—Following previous investigations which suggest a seasonally varying sensitivity, it is shown that the body temperature is not only a function of the temperature of the air, but reaction to weather probably plays its decisive part. While in summer the body reacts to great sunshine duration by an increase of body temperature, this is also the case in winter, when sunshine is poor. *Subject Headings:* **1. Health resorts 2. Climatotherapy.**—*Author's abstract.*

12.6–436 551.586:615.834

Wojtowicz, Wł., **Die Auswertung der klassischen Klimadaten in der Kurortklimatologie am Beispiel des Talkessels von Kłodzko (Glatz).** [Analysis of conventional climatic data in resort climatology, using the Kłodzko Basin as an example.] *Angewandte Meteorologie*, Berlin, 3(11):333–338, May **1960.** 4 figs., table, 8 refs. German, English and Russian summaries p. 333. **DLC**—If particular bioclimatological parameters, e.g., radiation, cooling power and equivalent temperatures are not available, conventional climatological material may successfully be utilized for bioclimatological work. For the presentation of climatic conditions of comparatively small and uniform mountain regions the orographic profile of the several climatic elements and a subsequent analysis of the amount of precipitation as related to elevation proved to be very useful. By application of this procedure the author was enabled to establish in the Kłodzko Basin (Glatzer Becken) five highland climatic zones. *Subject Headings:* **1. Health resorts 2. Resort climates 3. Kłodzko, Poland.**—*Author's abstract.*

UPPER AIR CLIMATOLOGY (551.587)

See: **Upper air winds over the world** (Heastie, Stephenson), 12.6–25; **Horizontal and vertical zonation of tropical mountain climate** (Troll), 12.6–29; **Symposium on met. and climat. of Carpathian Mts.** (Steinhauser), 12.5–69.

ENVIRONMENTAL INFLUENCES (551.588)

See also: **Forest influence on mudflows** (Mamedov), 12.6–33; **Influence of Lake Balaton on humidity and temp.** (Péczely), 12.6–235; **Water vapor fluctuations over a lake surface** (Staley), 12.6–236.

12.6–437 551.588.2:551.4(931)

Lister, R. G. (*Univ. Otago, Dunedin, New Zealand*), **Landscape and economy in southern New Zealand.** *Australian Journal of Science*, Sydney, 21(6a):218–225, Feb. **1959.** fig. **DLC**—This is a centennial review in geographic terms of the region south of the Waitaki River as characterized by three contrasting provinces. One is west of its coast-to-coast distance of same 60 miles consisting of uninhabited unexplored terrain of widespread glacial features, rain forests and alpine flora. The second, extending north to south of this landscape for about 150 miles is a forest clad fjord landscape where the heavy precipitation (unrecorded) frequently comes in violent downpours on the mountain slopes, upper part of which are snow covered more than 6 months of the year. At Milford Sound 250 inches are recorded at sea level. The hydroelectrical potential awaits its utilization. The southern part, around Invercargill is well farmed, enjoying well distributed rainfalls and is well drained providing grazing for the sheep industry. The third province, Central Otago only 80 miles east of Milford (250 in. rain) the Alexandra recording of but 13 inches shows up in deteriorated landscape in sharp contrast with the progressive farming in the valley regions where drainage is developed. There is

maximum rainfall in the rainfall regime in summer but this and the coastal rain is hampered by sheltering. Hence the water shortage is a problem and another problem is the spring frost. *Subject Headings:* **1. Topographic effects 2. Climate of New Zealand 3. New Zealand.** —*W.N.*

12.6–438 551.588.2:551.436:551.552

Spurr, G. (*Central Electricity Res. Labs.*), **The channelling effect of a valley.** *Weather*, London, 14(9):270–272, Sept. **1959.** 3 figs. **DLC**—That a valley may exert a channelling effect on the general wind pattern was found during a study of atmospheric pollution made in the Llynji Valley, about 20 mi west-north-west of Cardiff. To examine this effect, wind data from Cardiff Airport and Llynji Power Station were compared and the results are noted. A contour map of Llynji Valley and frequency diagram of wind directions and of mean deviations of wind directions are included. It is found that Llynji Valley had a channelling effect, particularly on winds blowing from between 040 degrees and 170 degrees. *Subject Headings:* **1. Horizontal wind components 2. Topographic effects on winds 3. Llynji Valley, Cardiff, Wales.**—*I.S.*

MISCELLANEOUS

COSMIC INFLUENCES

12.6–439 551.590.21:551.524.2:551.542

Graics, A'gnes, **A nyomás -és hőmérséklet-mező átalakulása erős napkitörések után.** [Transformation of the temperature and pressure pattern after strong solar eruptions.] *Időjárás*, Budapest, 63(4):236–238, July/Aug. **1959.** 3 figs., 12 refs. **DLC**—Some relations between solar activity and meteorological phenomena are surveyed by analyses of variations of magnetic character values with the change of the pressure field according to Shapiro, Craig, Willett, Asakura and Katayama, Woodbridge-Macdonald-Pohrte, Mironovich and Viaut, Wurlitzer; the temperature effect of solar disturbances according to Scherhag and Craig, the development of soil temperatures following strong solar eruptions according to Baur, Rodewald, Visser, Clayton. The author's own analyses on the relation of solar activity and temperature field on the basis of the results of the periods Jan. 1–March 31 of the years 1954–1958 are also presented. The physical explanation of these phenomena as endeavored by Shapiro and Péczely, indicate the effectiveness of ultraviolet radiation and of corpuscular incursion in view of the general atmospheric circulation. A chart and two diagrams illustrate the survey. *Subject Heading:* **1. Solar-weather relationships.**—*O.T.*

12.6–440 523.75:551.590.21:551.513.1

Ped', D. A. and Sidochenko, T. V., **Kolebaniia tsirkuliatsii atmosfery i ikh sviaz' s solnechnoĭ aktivnostiu.** [Changes in atmospheric circulation and their relation to solar activity.] *Időjárás*, Budapest, 63(5):257–265, Sept./Oct. **1959.** fig., 5 tables, 7 refs., eq. German summary p. 257; Hungarian summary p. 264–265. **DLC**—The paper covers 21 years of observation (1938–1958) on the fluctuation of the atmospheric circulation in the Atlantic-European area between the latitude 40–70° and longitude 20°W 80°E. The authors applied the Kac index and treated only the yearly average fluctuations. The intensity of fluctuations showed a gradual increase during this period. They came to the conclusion that there is a correlation between the annual mean of the circulation index and the change of solar activity. The frequency of special macroprocesses could be useful in long range weather forecasting. *Subject Headings:* **1. Solar activity 2. Solar-atmospheric relationships 3. Atmospheric circulation oscillations.**—*From Hungarian summary (E.K.).*

12.6–441 551.590.21

Vitel's, L. A., **O vozmozhnoĭ prichine izmeneniĭ solnechno-atmosfernykh sviazeĭ.** [Possible causes of the changes of solar-atmospheric relationships.] *Meteorologiia i Gidrologiia*, Moscow, No. 7:9–13, July **1960.** 2 figs., 7 refs. **DWB, DLC** (QC851.M27)—The effect on the atmospheric processes of the influx of solar corpuscular particles into the upper atmosphere can be very varied. Because of this they might be considered as non-real. This paper shows

that these effects are in fact quite marked and to suggest a mechanism which would account for the variations. RAKIPOVA has suggested a circulation system consisting of layers with alternating cyclonic and anticyclonic circulations. The effect of influx of corpuscular radiation into one of these layers would have differing effects according to the existing circulation within the layer. In addition particles of different speeds would penetrate into different layers and complicate the effects. Data for 1900–1939 have been analyzed to show the effect on circulation indices of magnetic storms. This shows that the effect is usually marked but is variable. *Subject Heading:* **1. Solar-atmospheric relationships.**—*R.B.*

VISIBILITY

12.6–442 551.591:656.71

Fremming, Ørnulf, **An investigation of the horizontal visibility under low clouds in order to obtain results that can be of practical use in the air traffic.** *Meteorologiske Annaler*, Oslo, 4(15):401–430, **1959.** 5 figs., tables, 5 refs., eqs. **DLC**—Five years (1949–53) of 3-hourly observations taken at Gardermoen, Fornebu and Sola airports were used to examine the relationship between horizontal visibility at the ground and the height of the cloud base. For various cloud height groups up to 1000 ft, graphs are presented showing the percent frequency of associated visibilities from 0 to >9 km, and for three selected conditions: no precipitation; rain and drizzle; and snow and sleet. With low cloud bases the graphs show a concentration of visibilities at the lower end. Pt. 2 of this paper considers the variation of horizontal visibility in successive layers between the ground and the base of the clouds. Certain conclusions are reached, and models of the vertical variation of horizontal visibility are employed to arrive at estimates of slant visibilities, from which contact heights (height at which aircraft first sees ground, looking forward along glide path) are worked out for the airports mentioned above, under conditions of precipitation and no precipitation. *Subject Headings:* **1. Horizontal visibility 2. Cloud base height 3. Norway.**—*R. S. Quiroz.*

12.6–443 551.591.1:535.6

Middleton, W. E. Knowles, and Gottfried, Hanna S. T., **Apparent intensities of colored signal lights.** *Illuminating Engineering*, N. Y., 52(4):192–196, April **1957.** fig., 3 tables, 7 refs., eq. **DLC**—Luminous intensities of a 17-colored signal light are investigated. The results are not as encouraging as expected but serve as a preliminary report of some engineering value. Several point sources are compared. The observers had to pass the Hardy-Rand-Rittler pseudo-isochromatic test the New London Lantern test and the Farnsworth D-15 test and were later tested on a Nagel anomoloscope. The instrument used and described here, has an elaborate circuit that gives automatic representation of the object and also counts the responses. In general, the observers noticed that whenever 2 objects were observed together, they changed places at the end of each of 80 observations. Only two of these observers were able to observe the 17 colors. Their data are summarized. *Subject Headings:* **1. Colored signal lights 2. Colorimetry.**—*N.N.*

OPTICAL PHENOMENA (551.593)

See also: **Calculating the diameter of particles from turbidity** (Slonim), 12.6–257.

12.6–444 551.593.12:523.164.42:551.515

Fürth, R., **Statistical analysis of star scintillations as a means for investigating atmospheric disturbances.** (In: Physical Society, London, **Physics of the ionosphere,** London, Physical Society, **1955.** p. 140–149. 6 figs., table, 22 refs., 10 eqs.) **DWB** (M10.535 C748)—It is shown that significant features of the phenomenon of brightness fluctuations of star images can be revealed when records of such fluctuations are subjected to a statistical analysis on the basis of well-known principles of the theory of stochastic processes. The method used consisted in computing the so-called 'after-effect function' for a statistically stationary series of observations from the shape of which definite conclusions can frequently be drawn as to the character of the elementary processes which give rise to the fluctuation phenomenon. The method was applied to records of star scintillations obtained by ELLISON and SEDDON with telescope

apertures between 36 and 3 in. It appears that the fluctuations are due to a more or less random sequence of 'pulses' of a few hundredths of a second duration and average intervals depending on the size of the aperture. This can be satisfactorily interpreted as the result of the passage of 'schlieren' patches over the telescope mirror, of about 30 to 40 cm width, moving with an average speed of about 15 m sec^{-1}. The nature and location of the disturbances which are responsible for the schlieren is discussed and the application of the same method to the statistical analysis of fluctuations of signals from radio stars is suggested. *Subject Headings:* **1. Star scintillation analysis 2. Atmospheric disturbances 3. Schlieren.** —*Author's abstract.*

12.6–445 551.593.63:551.576.1:551.555.3

Marquardt, W. (*Met. Obs., Wahnsdorf*), **Eine seltene bodennahe Haloerscheinung.** [An unusual halo phenomenon near the ground.] *Zeitschrift für Meteorologie*, Berlin, 13(1/6):133–134, Jan./June **1959. DWB, DLC**—The phenomenon, as observed on Feb. 8, 1959 from a train window, on the way from Geising to Altenberg is described in connection with a föhn wall and ice needle precipitation accompanying it. The föhn wall at −8°C was a water cloud. Very strong winds transported splinters of ice crystals from snow on a ridge into the föhn wall. Because of over-saturation of the cloud in respect to ice, the splinters grew to ice crystals at the expense of the waterdrops. The cloud dissolved in the lee of the ridge; the water drops evaporated but the ice crystals remained. *Subject Headings:* **1. Halo phenomenon 2. Föhn wall 3. Saxony, Germany.**—*O.T.*

12.6–446 551.593.63

Schröder, W. (*Rönnebeck*), **Beobachtung des Rönnebecker-Halophänomen.** [Observation on the Rönnebeck halo phenomenon.] *Meteorologische Rundschau*, Berlin, 13(1):14–15, Jan./Feb. **1960.** fig., ref. **DWB, DLC**—A report of the observations on a solar halo that appeared in Bremen-Rönnebeck on March 12, 1959 is presented. A diagram of the halo is given. The phenomenon began at 10:05 o'clock when the small ring with both parhelia were visible. The colors of the circumscribed halo were distinct; the upper tangent arc of the large run crowned the halo. The horizontal circle was very distinct. The infralateral arc was magnificient. The eastern "horn" of the circumscribed halo extended far out. Detailed descriptions are given of the individual halo parts—the small ring, the upper tangential arc of the small ring, the circumscribed halo, the large ring, the ordinary sun days, the circumzenith arc, the tangential arc at the upper vertex of the large ring, the small infralateral arc, the horizontal circle, the 35° sun days, the arc of Parry, the counter sun, etc. *Subject Headings:* **1. Halo phenomena 2. Bremen, Germany.**—*I.L.D.*

12.6–447 551.593.63:551.506.7:629.135

Singleton, F.; Kerley, M. J. and Smith, D. J. (*all, Met. Research Flight*), **Recent observations from aircraft of some rare halo phenomena.** *Weather*, London, 15(3):98–102, March **1960.** fig., 4 refs. **DWB**—Describes some of the halo phenomena observed from aircraft. These observations were made by another plane at a height of 16–21 thousand ft. The phenomenon observed on April 23 was caused by an upper cirrus layer. The real cause of the halo forms is not known. Of the ten halo observations, eight were formed at a temperature of 10°C–26°C. *Subject Heading:* **1. Halo phenomena.**—*A.H.K.*

ELECTRICAL PHENOMENA (551.594)

See also: **Lightning** (Vieveister), 12.6–10; **Satellite ionization phenomenon** (Kraus et al.), 12.6–106; **Ionization distribution in the F2 region** (Martyn), 12.6–177; **Nocturnal ionization in the E layer** (Haubert), 12.6–198; **Field aligned ionization** (Mawdsley, Ward), 12.6–210.

12.6–448 551.594.11:551.510.721:662.2:539.1

Stewart, K. H. (*Kew Obs., Richmond, Surrey*), **Some recent changes in atmospheric electricity and their cause.** *Royal Meteorological Society, Quarterly Journal*, 86(369):399–405, July **1960.** 2 tables, 11 refs. **DWB, DLC**—Annual mean values of atmospheric electrical potential gradient are tabulated for three British and two Portuguese stations and it is shown

that unusual changes have occurred since 1952. These changes could be explained by an increased conductivity of the air near the ground. Measurements of β-ray ionization made at the British stations indicate that the increase in conductivity has been produced by a surface deposit of radioactive material attributable to nuclear-test explosions. *Subject Headings:* **1. Atmospheric electricity 2. Radioactivity in the atmosphere 3. Great Britain 4. Portugal.** —*Author's abstract.*

12.6–449 551.594.223

Hill, E. L. (*Univ. Minnesota*), **Ball lightning as a physical phenomenon.** *Journal of Geophysical Research*, Wash., D. C., 65(7):1947–1952, July **1960.** 20 refs. **DLC**—Ball lightning has not been produced in the laboratory as yet, but its existence as a real natural phenomenon seem to be assured. The evidence concerning its physical nature is reviewed in the light of known information on atmospheric electricity and the lightning discharge. It is concluded that it is unlikely that ball lightning is a plasma phenomenon, as it is frequently assumed to be. More probably it is a region containing a strongly inhomogeneous distribution of space charge in the form of highly ionized gas, the ionization being primarily in the molecular form, with few free electrons. Occluded material such as dust, water vapor, and combustible gases may play a significant role in its behavior. *Subject Heading:* **1. Ball lightning.**—*Author's abstract.*

12.6–450 551.594.223

Watson, W. K. R. (*Dept. Physics, Univ. So. Calif.*), **A theory of ball lightning formation.** *Nature*, London, 185(4711):449–450, Feb. 13, **1960.** 3 refs., 14 eqs. **DWB**—It is pointed out that a polarized electromagnetic standing wave can actually produce containment of charged particles in the neighborhood of its electric nodes and that this effect should be important in the initial stages of fireball formation. It is possible for electrons to acquire sufficient energy in the electric node regions to produce further ionization by collision provided that the standing electromagnetic wave yield-strength is in the vicinity of 10^6 V/m. *Subject Heading:* **1. Ball lightning formation.**—*E.Z.S.*

12.6–451 551.501.776:551.594.253

Allee, Paul A. and Phillips, B. B. (*both, U. S. W. B., Wash., D. C.*), **Measurements of cloud-droplet charge, electric field, and polar conductivities in super-cooled clouds.** *Journal of Meteorology*, Boston, 16(4):405–410. **1959.** 3 figs., 5 refs., 4 eqs. **DWB, DLC**—Measurements have been made of the radii and free electric charges of cloud particles in supercooled cumuliform-type clouds which occurred at a 6580-ft MSL mountain observatory. Simultaneously, the positive and negative conductivities in the cloud and the atmospheric electric field at the site were recorded. The observed droplet charge distribution is symmetric about zero charge and approaches the equilibrium distribution described by the theory of random ionic diffusion electrification of cloud particles. *Subject Headings:* **1. Electrification of cloud droplets 2. Cloud charge distribution.**—*Authors' abstract.*

12.6–452 551.594.253

Ramsay, M. W. and Chalmers, J. Alan (*both, Univ. of Durham*), **Measurements on the electricity of precipitation.** *Royal Meteorological Society, Quarterly Journal*, 86(370):530–539, Oct. **1960.** 6 figs., 3 tables, 8 refs., several eqs. **DLC, DWB**—Measurements have been made of the electricity of precipitation, the potential gradient and the rate of rainfall. The results for the winter of 1957/58 show general agreement with those of earlier workers, in giving a linear relation between potential gradient and precipitation current, but those of the summer of 1958 are less ordered. Comparisons have been made of the currents to open and shielded receivers, and show general agreement. The 'mirror-image effect' and time delays connected with it have also been studied, without any complete explanation. *Subject Heading:* **1. Electricity of precipitation.**—*Authors' abstract.*

PART II. ANNOTATED BIBLIOGRAPHY ON UPPER ATMOSPHERE STRUCTURE ABOVE 300 KM.

Compiled by: Elemer Kiss

INTRODUCTORY NOTE

This is the third and last in a series of compilations on upper atmospheric structure. The first bibliography, in the April 1961 issue of *Meteorological and Geoastrophysical Abstracts*, contained 210 items covering the 30–80 km altitude range; the second publication, in the May 1961 issue, was concerned with atmospheric structure from 80–300 km (180 items). This issue presents about 100 items treating the atmospheric regions beyond 300 km. Observations carried out with satellites are emphasized.

A few items supplementary to the previous compilations, published in April and May 1961 (12D and 12E *Met. Abs.*), have been added at the end of this bibliography.

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1932

12F–1 551.594.52:551.524.7

Angenheister, G., **Die Höhe der Polarlichter und die Temperatur der oberen Atmosphäre.** [Height of the aurora and temperature of the upper atmosphere.] *Terrestrial Magnetism and Atmospheric Electricity*, 37(4):431–438, Dec. **1932.** 2 figs., tables, refs., eqs. **DLC**—Air density and temperature of the upper atmosphere up to 700 km are derived from differences in daytime and nighttime altitude of auroras. According to the author's reasoning, the atmosphere would warm up to 1000 Å between 100 and 200 km altitude and consequently expand considerably. It would contract during nighttime, cooling down to 300 Å. Other methods of determining stratosphere temperature are reviewed. (*Same item as* 4J–79, Oct. 1953, *Met. Abs.*) *Subject Headings:* **1. Auroral heights 2. Upper air temperatures.**—*G.T.*

1935

12F–2 551.594.51:551.510.535/6

Gusev, P. I., **Poliarnye siianiia i verkhnie soil zemnoĭ atmosfery.** [Auroras and the upper layer, of the earth's atmosphere.] (In: Vsesoiuznaia Konferentsiia po Izucheniiû Stratosfery, Leningrads **1934, Trudy,** p. 283–289, **1935.** 6 refs., eqs.) Not transl. into English. **DLC** (QC879.V8 1934)—An article reviewing the progress in study of the height, structure and composition of the atmosphere from 80–1000 km which has resulted from studies on the physics of the aurora and auroral spectra beginning with BIRKELAND's famous demonstration of the analogy between the aurora and laboratory models using cathode rays, and his conclusions regarding the corpuscular radiations from the sun, and later work of VEGARD in identifying auroral spectral lines. Theory which allows calculation of temperature in auroral layers is presented. MARIS and HULBURT's UV theory of aurora (*see* 5C–51, *Met. Abs.*) is also reviewed critically. Ionization and radiowave reflection from ionosphere

also considered. (*Same item as* 5C–68, March 1954, *Met. Abs.*) *Subject Headings:* **1. Auroral spectra 2. Outer atmosphere structure.**—*M.R.*

1936

12 F-3 551.524.7:551.521.326

Das, A. K., **On the temperature of the earth's outer atmosphere and the forbidden OI lines of the night-sky spectrum.** *Beiträge zur Geophysik*, 47(1/2):136–148, **1936.** fig., foot-refs., 5 eqs. **DLC**—After referring to various methods of estimating the high temperatures of the outer atmosphere, the author in the present paper proposes to indicate a possible connection between these high temperatures and the presence of neutral atomic O. From a theoretical consideration he finds that if the neutral O atoms in the high atmosphere absorbed selectively from the solar spectrum the lines 2972, 5577, 6364 Å, and the energy absorbed was converted into thermal energy, the temperature should be in the neighborhood of 2000 Å. At night the value would be about 1000 Å. The intensity of the green line calculated from the temperature deduced from the suggested mechanism agrees well with the observed intensity. The author concludes that this process of selective absorption and emission by the neutral O atoms offers an explanation of the high temperatures and of the emission of the green line with intensity decreasing towards midnight as observed. The paper concludes with a discussion of the two assumptions made. (*Same item as* 8B–10, Feb. 1957, *Met. Abs.*) *Subject Headings:* **1. Upper air temperatures 2. Night airglow spectrum 3. Atomic oxygen.**—*Physics Abstracts, No. 3557, 1936.*

1952

12F–4 551.510

Bilancini, Raoul, **La struttura dell'atmosphera.** [Structure of the atmosphere.] *Rivista di Meteorologia Aeronautica*, 12(4):61–62, Oct./Dec. **1952. DWB**—Review of a paper by C. Blot, published in *Forces Aériennes Françaises*, May **1952.** Chemical composition, stratification, temperature distribution and radiation in the atmosphere are discussed. According to Blot the height of the atmosphere is 2500 km. (*Same item as* 5.2–81, Feb. 1954, *Met. Abs.*) *Subject Headings:* **1. Atmospheric structure 2. Reviews. I. Blot, C.**—*G.T.*

12F–5 551.510.41:551.594.51

Harang, Leiv (*Norwegian Defense Res., Kjeller, Norway*), **Constitution of the upper atmosphere as determined from auroral studies.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 11:55–66, **1952.** 3 figs., 15 refs. Discussion. **DWB**—The height distribution of the aurora in space, the spectrum of the aurora, and the nature of the luminosity curve, the pressure, density, temperature and composition of the upper atmosphere can be determined in some cases precisely, and in others approximately. Latitude effects are discussed and illustrated, and the importance of sunlit aurora for determining character of atmosphere to a height of more than 1000 km is mentioned. However, the nature or cause of the aurora itself is still uncertain. (*Same item as* 5C–203 and 4.9–68, *Met. Abs.*) *Subject Headings:* **1. Auroral physics 2. Upper atmosphere research.** —*M.R.*

12F–6 551.510.536

†Spitzer, Lyman, Jr. (*Princeton Univ. Observatory*), **The terrestrial atmosphere above 300 km.** (In: Kuiper, G. P. (*ed.*), **The atmospheres of the earth and planets. Rev. ed.** Chicago, Univ. of Chicago Press, **1952.** p. 213–247. 5 tables, 24 eqs., 72 refs.) **DWB**—As a preliminary background, the first section summarizes the relevant data on the atmosphere below 300 km. The second section presents theoretical expectations about the general nature of the atmosphere above this height, and comparison is made with the available observations. The kinetic temperature is discussed in the third section, while escape of planetary atmosphere is treated in the fourth section. The final section summarizes the general results and points out the particular fields in which additional research is required. (For abstract on 1st ed., *see* 11–53, Nov. 1950, *Met. Abs.*) *Subject Heading:* **1. Upper atmosphere research.**—*E.Z.S.*

1953–54

12 F-7 551.510.53

†Kallmann, H. K., **Investigation of atmospheric properties at great altitudes.** *Rand Corporation, Santa Monica, Calif., Project Rand, Research Memorandum*, 1047, Feb. 27, **1953.** 48 p. 5 tables, 5 figs., 34 eqs., 44 refs. **DWB**—The physical properties of the atmosphere have been investigated in the region between 200 and 600 km, with emphasis on the determination of density, pressure and kinetic temperature. Observations obtained were based on high altitude rockets, as well as on radio waves and on studies of photon emission from the Sun. Various atmospheric models have been devised and studied. The result of this study is that the mass density of the atmosphere in all

models considered here will not be greater than $\sim 10^{-16}$ and will not be less than $\sim 10^{-17}$ gm/cm at about 600 km. The lowest pressure at that height is $\sim 1.3 \times 10^{-10}$ and the highest pressure 5×10^{-9} gm/cm^2, while the lowest particle density obtained is 6×10^5 cm^{-3}, and the highest is 1.1×10 cm^{-3}. *Subject Headings:* **1. Upper atmosphere properties 2. Upper air temperatures 3. Upper a pressure 4. Upper atmosphere densities.**—*E.K.*

12F–8 551.510.5

Singer, S. F., **Physics of the high atmosphere.** *Nature*, London, 171(4343):146–148, Jan. 2 **1953.** 5 refs. **DWB**—Report of discussion at British Association for the Advancement of Scienc Section A (Physics and Mathematics), Sept. 5, 1952. F. E. Roach described research on night airglov W. R. Piggott discussed special results from ionospheric reflection data (tidal oscillations, electro density), S. F. Singer, discussed shortcomings and future possibilities of high-altitude sounding roc ets. Finally, D. R. Bates considered problems of temperature of exosphere. Singer points out tha "the overall impression gained from these talks is that many of the fundamental features whic affect the atmosphere are at present either unknown or roughly inferred," e.g., UV and X-ray sola spectra. (*Same item as* 4.8–77, Aug. 1953, *Met. Abs.*) *Subject Headings:* **1. Upper atmospher research. I. Roach, F. E. II. Piggott, W. R. III. Bates, D. R.**—*C.E.P.B.*

1955

12F–9 551.510.535:551.524.

Chatterjee, B. (*Indian Inst. of Technology, Kharagpur, India*), **Discussion on the variation o F-region height.** *Journal of Geophysical Research*, Wash., D. C., 60(3):325–327, Sept. **1955.** fig 3 refs. **DLC**—Variations of F2-region height with season and solar activity have been explained i terms of the author's picture of ionization distribution in the F region. Different types of behavio of F2-region height at different latitudes are accounted for by the presently accepted model of tem perature distribution in the upper atmosphere. (*Same item as* 11F–20, June 1960, *Met. Abs.*) *Subject Headings:* **1. F2 layer height variations 2. F layer ionization 3. Upper air temperatures** —*Author's abstract.*

12F–10 551.510.53

Kallmann, H. K., **Estimate of average atmospheric properties between 500 km and 1000 km** *Rand Corporation, Santa Monica, Calif., Research Memorandum* RM-1505, June 21, **1955.** 16 p 2 figs., 3 tables, 8 refs., 12 eqs. **DWB**—An estimate of the atmospheric densities at altitudes betwee 500 km and 1000 km has been made. Since no direct observations are available of any of the physica properties of the atmosphere at these heights, the analysis has been based upon deductions mad from other information. Due to large changes in electron densities and changes in wind velocities both of which have been observed, a large variation in individual particle density can be expected By studying different atmospheric models, the results can be summarized as follows: At an altitud of 800 km (500 mi), the maximum and minimum particle concentration are of the order of 10^6 t 10^5 particles per cm^3; and the maximum and minimum densities are of the order of 1×10^{-17} to 5×10^{-1} gm per cm^3. (*Same item as* 8.6–188, June 1957, *Met. Abs.*) *Subject Headings:* **1. Exospher 2. Upper atmosphere densities.**—*Author's abstract.*

1956

12F–11 551.507.362.2:521.31

Petersen, Norman V., **Summary of proposed methods for determining satellite lifetimes** *International Astronautical Congress, Proceedings of the 7th Congress, Rome, 1956*, issued Rome, **1956** p. 789–810. 10 figs., table, 16 refs., 20 eqs. **DLC** (TL787.I44)—Recent literature has illustrated the points-of-view of several authors on procedures for using orbit tracking information from the Project Vanguard satellite to calculate the atmospheric density variation with altitude or conversely to determine the orbit lifetime based on an accepted density variation. The task of determining this density variation with altitude, $\rho = f(h)$, is an extremely complicated problem, both from the standpoint of measurement and correlation of orbit coordinate data and the mathematics involved On one hand, the actual orbit coordinate data obtainable from optical and radio observations may well be relatively sparse. The very limited number of ground observation stations, coupled with the many attenuating aspects such as cloud cover, electronic failure and others, may provide at best only a small number of positional fixes of the orbit. It is quite probable that continuous orbit tracking with several fixes per revolution will be the exception to the rule. On the other hand, only machine computational techniques will permit the solution of the equations of motion from the available data points. The mathematical problem is complicated by the fact that not only several dissipative forces exist, but that other perturbing forces may make it difficult to discriminate drag effects from the resultant perturbations. The purpose of this paper is to review briefly the several methods

proposed to determine the orbit lifetimes and the density-altitude relationship by considering satellite orbit displacements. (*Same item as* 12.1–157, Jan. 1961, *Met. Abs.*) *Subject Headings:* **1. Satellite orbits 2. Ionospheric density variations.**—*Author's abstract.*

12F–12 551.507.362:551.510.3 551.507.362.2:551.547

Sicinski, H. S.; Spencer, N. W. and Boggess, R. L. (*all, Engineer, Res. Inst., Univ. of Michigan, Ann Arbor*), **Pressure and density measurements through partial pressures of atmospheric components at minimum satellite altitudes.** (In: Van Allen, James A. (*ed.*), **Scientific uses of earth satellites.** Ann Arbor, Univ. of Michigan Press, **1956.** p. 109 119, 5 figs., 12 refs., 14 eqs.) **DWB, DLC.** Also in: Michigan. Univ. Engineering Research Institute, Contract AF 19(604)-545, Report CS-5 March 1956.—Pressures in 400–900 km ranges are expected to be 10^{-10} to 10^{-8} mm, and densities 10^6 to 10^8 particles/cm^3. Ionization chambers would not be useful in this range but a modified "omegatrons" or "synchrometers" would be sensitive at 10^{-10} mm pressure. Equipment operates like a cyclotron; the ions are accelerated by the alternating field. Article specifies environment, theory of operation of "synchrometer." Resolution, data output, satellite instrumentation, ionized and unionized environment and tuned gages are outlined. (*Same item as* 8.9 70, *and* 11J-150, *Met. Abs.*). *Subject Headings:* **1. Satellite pressure measurements 2. Satellite density measurements 3. Synchrometers.**—*M.R.*

12F–13 551.507.362.2:551.510.3:551.510.53

Spitzer, Lyman, Jr. (*Princeton Univ. Obs.*), **On the determination of air density from a satellite.** (In: Van Allen, James A. (*ed.*), **Scientific uses of earth satellites.** Ann Arbor, Univ. of Mich. Press, **1956.** p. 99–108. 8 refs., 10 eqs.) **DWB, DLC**—Methods are analyzed for determining upper air densities by means of a satellite, either by measures of the orbit or by measures of the change in orientation of a suitably designed vehicle. The orbital method gives enormous accuracy for the air density at perigee altitude, but fluctuations of perigee density with time may prevent accurate density determinations at heights much above the perigee altitude. If a satellite is designed so that its center of pressure is far from its center of mass, measures of the change in orientation with time can, in principle, determine air densities much less than the probable density of 4×10^{-15} gm/cm^3 at 300 km height. For a spinning satellite of about the weight and size planned for the IGY, a measurement of the precession rate by means of photocells observing the Sun and the Earth would permit measuring air densities as low as 10^{-16} gm/cm^3, after eddy currents produced by the Earth's magnetic field increased the spin period to about 100 sec. (*Same item as* 9.3–85 *and* 11J–160, *Met. Abs.*). *Subject Headings:* **1. Satellite density measurements 2. Upper atmosphere densities.**—*Author's abstract.*

1957

12F–14 551.510.3:551.501.724

Miller, Lewis E., **Molecular weight of air at high altitudes.** *Journal of Geophysical Research*, Wash., D. C., 62(3):351–365, Sept. **1957.** 6 figs., 2 tables, 15 refs., 27 eqs. **DLC**—This report describes a method for obtaining the so-called "molecular weight" of air at high altitudes of the earth's atmosphere above the transition region for the dissociation of molecular into atomic oxygen. A reasonable working model, based upon the ratio of absolute temperature to molecular weight T/M, which is proportional to the slope of the $\log_e$ pressure vs altitude curve, is presented. The region considered is from 90 to 600 km, assuming that the composition of the atmosphere is constant up to 90 km. The calculations are based upon experimental data reported by Byram, Chubb, and Friedman from Aerobee 16, Dec. 1, 1953. Since the 1956 Model Atmosphere of the Air Research and Development Command employs a variable scale height gradient with altitude, the diffusive equilibrium and mixing formulas of Nicolet and Mange were modified to obtain the vertical distributions of the various atmospheric constituents. The mass densities are found by multiplying the number densities by the respective molecular mass of the individual components of the atmosphere. The molecular weights at the various altitudes were calculated from the formula

$$\frac{\text{Total mass density}}{\text{Total number density}} \times N_0 \text{ (Avogadro's number)} = \text{Molecular weight.}$$

Knowing the composition of the atmosphere at any altitude, it is possible to determine the temperature through the relationship of the scale height to temperature, $H = RT/Mg$. (*Same item as* 9.9–149, Sept. 1958, *Met. Abs.*) *Subject Headings:* **1. Molecular weight of air 2. Upper atmosphere densities 3. Standard atmosphere 4. Upper air temperature calculations.**—*Author's abstract.*

12F–15 551.524.7

Nicolet, M., **Température à la limite de la thermosphère.** [Temperature at the limit of the thermosphere.] *Académie Royale de Belgique, Brussels, Classe des Sciences, Bulletin*, 5th Ser.,

63(10):731–739, Oct. 1957. 2 tables, 7 refs., 18 eqs. **DWB, DLC**—A steady conductive heat flo in the thermosphere with a temperature of 2250°K at the critical level implies a flux of coron energy actually trapped by the earth's atmosphere of the order of 0,7 erg cm^{-2} sec^{-1}. (*Same item* 9.7 201, July 1958, *Met. Abs.*) *Subject Headings:* **1. Temperature in the thermosphere 2. Out atmosphere temperature.**—*A.V.*

1958

12F–16 551.510.535:551.507.362

Al'pert, Ia. L., **Sostoianie vneshneĭ ionosfery.** [The state of the outer ionosphere.] *Prirod.* Moscow, No. 6:86–87, June **1958.** table, 3 foot-refs. **DLC.** Transl. into English by E. R. Hop issued as *Canada. Defence Research Board, Translation* T-304-R, Sept. **1958. DWB**—The metho of radio observations on the first earth satellite is described briefly and the results of such observatio at 6 points during Oct. 5, 6 and 7, 1957 are summarized. The electron concentration in the outer ionosphere diminished with altitude considerably more slowly than it increased in its lower portion A table is presented giving the electron concentration N/cm^3 up to 3100 km and also the density o neutral particles per cm^3 up to the same height. The computation of the density of the latter described. At distances of 2000–3000 km from the earth, the electron concentration is close t 10^3–10^2 electrons/cm^3 and the density of neutral particles is of the order of 1 per/cm^3. Hence th atmosphere approaches the properties of interplanetary gas at 2000–3000 km. The agreemen between the data on the outer atmosphere obtained by means of rockets and lunar signals is compare with those obtained with the artificial earth satellite. (*Same item as* 10.10–201, Oct. 1959, *Met. Abs.*) *Subject Headings:* **1. Ionospheric characteristics 2. Satellite ionospheric observations.**—*I.L.D.*

12F–17 551.506.7:551.507.362.2:61

Einige Ergebnisse der ersten beiden russischen Erdsatelliten. [Some results of the first tw Russian earth satellites.] *Die Umschau*, Frankfurt a.M., 58(11):341, June **1958. DWB, DLC**— summary of a report published in *Pravda* (Moscow, No. 37, May 7, **1958**) on the results of the observa tions obtained by Sputnik I and II. The data from both satellites revealed that the temperatur of the atmosphere at 225 km is greater than assumed hitherto on theoretical grounds. From th deviation of the radio beam of 40 MHz of the satellite transmitter in the ionosphere it is conclude that the diminution of electron concentration in the outer parts of the ionosphere is 5 to 6 time slower than the increase up to 300–400 km. The intensity of cosmic radiation increased by 40% between 225 and 700 km. The cosmic radiation is subject to considerable oscillations which are no observable at the surface of the earth. Furthermore "Laika" withstood the starting acceleration which exceeded gravity several fold, without any untoward effects. The electrocardiogram showe no pathological symptoms; it showed a picture of sinus tachycardia. The initial increase in th heart rate increased and then diminished. After the satellite was in its course the respiration rat was 2–3 times that at the beginning of ascent, it decreased during weightlessness. The changes i the physiological functions corresponded essentially with those observed in rocket investigations (*Same item as* 11J–172, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Satellite observations 2. Hig altitude temperatures 3. Physiological effects on satellite passengers 4. Soviet satellites.**—*I.L.D.*

12F–18 551.510.53:551.510.3:551.507.362.

Harris, I. and Jastrow, R. (*both, Nucleonics Div., U. S. Naval Res. Lab., Wash., D. C.*), **Uppe atmosphere densities from minitrack observations on Sputnik I.** *Science*, Wash., D. C., 127(3296) 471–472, Feb. 28, **1958.** fig., 7 refs. **DLC**—Curves show density distributions for heights up t 500 km from Sputnik I ($\alpha 2$) data according to three different model atmospheres and compared wit an extrapolation of the ARDC "standard" atmosphere. At 400 km the Sputnik data indicate 40 times as dense atmosphere, reducing the life of a specified satellite from an estimated 4 yrs t 38 days, if the data presented are correct. Minitrack observations from Oct. 14–25, 1957 give a rat of change of period of 0.045 ±1003 min/day and a density at 280 km of 10^{-13} g/cm^3. *Subject Headings* **1. Upper atmosphere densities 2. Soviet satellite, 1957 Alpha (Sputnik I) 3. Satellite densit measurements.**—*M.R.*

12F–19 551.507.362.2:551.510.3:551.510.53

Harris, I. and Jastrow, R. (*both, Nucleonics Div., U. S. Naval Res. Lab., Wash., D. C.*), **Densit determinations based on the Explorer and Vanguard Satellites.** *Science*, Wash., D. C., 128(3321) 420–421, Aug. 22, **1958.** 2 tables, 5 refs. **DLC**—Tabulated data for (1) orbital periods for Explorer and (2) orbital periods for Vanguard I as obtained by the Vanguard Computing Center from Mini track data are presented along with (3) densities derived from satellite data as above and at altitude of 405 and 720 km respectively. The analysis was made to permit a rough estimation of densit of the atmosphere at lat. 33°N and 33°S. Because of strong dependence of upper air densities upo latitude, comparison between U. S. and U.S.S.R. density values was not made. (*Same item a*

11J-66, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Satellite density measurements 2. Upper atmosphere densities 3. U. S. satellite, 1958 Alpha (Explorer I) 4. U. S. satellite, 1958 Beta (Vanguard I).**—*W.N.*

12F-20 551.501.7:551.507.362.2

Krasovskiĭ, V. I., **Issledovanie verkhneĭ atmosfery pri pomoshchi tret'ego iskusstyennogo sputnika Zemli.** [The exploration of the upper atmosphere by means of the third Soviet artificial earth satellite.] *Priroda*, Moscow, No. 12:71–78, Dec. **1958.** 6 figs. **DLC.** Transl. into English issued in *International Astronautical Congress, Amsterdam, Aug. 1958, Proceedings*, Vol. 2:614–625, issued **1959.** 9 figs., eqs. **DLC** (TL787.I44). Also transl. into English in *Institute of Radio Engineers, N. Y. Proceedings*, 47(2):289–296, Feb. **1959.** 19 figs. (incl. photos). **DLC**—The various fundamental geophysical problems which were unresolved before the ascent of the third Soviet artificial earth satellite are discussed. The various theories on the source of heat energy of the upper atmosphere, such as the absorption of sound waves from the troposphere, heating by interplanetary gases, and by electric currents of the ionosphere; the rocket model atmosphere indicating a cold isothermal region in the upper atmosphere, the allotropic character of the atmosphere; the diffusive separation of atoms and molecules in the earth's gravitational field; the ionization produced by micrometeorites, etc., are summarized. With the aid of ionizing micrometers it was shown that the thickness of the layer of the homogeneous atmosphere increased with height; at a height of 260 km the density of the atmosphere was 10^{-13} gr/cm^3 and at 355 km it was 9.10^{-15}/cm^3. By means of a Bennet mass spectrometer mounted on the third earth satellite it was shown that at heights above 250 km only atomic ions of oxygen and nitrogen are present but atomic ions of oxygen predominate. This indicates that the upper atmosphere above 250 km has an atomic composition. By means of an ultrashort wave dispersion interferometer it was demonstrated that the electron density at an elevation of 475 km is 1.0×10^6 electrons/cm^2, as against 1.8×10^6 electrons/cm^2 at 290 km. Observations during two revolutions of the satellite showed that at a height of 475 km on May 15, 1958, 5–6 hrs after midday, at moderate latitudes, the negative potential of the satellite relative to the environment was 6.4 volts, indicating an effective electron temperature of 15,000°K, the corresponding concentration of positive ions was 1.8×10^5/cm^3. At an elevation of 275 km the concentration of positive ions was 5.2×10^5 corresponding to an effective electron temperature of 7000°K. Electron velocities recorded by the satellite were close to the velocity of light so that these electrons cannot be primary solar particles. The apparatus for studying ionization, such as the ion trap, and for determining the concentration of positive ions, for recording heavy electrons, for recording the collision of micrometeorites, etc. is described with the aid of photographs and diagrams. Also a detailed diagram of the third earth satellite with the various instruments in place is included. (*Same item as* 11J-95, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Soviet satellite, 1958 Delta (Sputnik III) 2. Satellite instrumentation 3. Upper air observation techniques 4. Upper atmosphere densities.**—*I.L.D.*

12F-21 551.507.362.2:551.510.53:551.510.3

Lidov, M. L., **Opredelenie plotnosti atmosfery po nabliudaemomu tormozheniiu pervykh iskusstvennykh sputnikov Zemli.** [Determination of atmospheric density from the observed deceleration of the first artificial earth satellites.] *Iskusstvennye Sputniki Zemli*, Moscow, No. 1:9–20, **1958.** 5 figs., 8 refs., 12 eqs. **DLC**—Transl. into English in *Artificial Earth Satellites*, N. Y. Plenum Press, Vol. 1, p. 10–24. **1960.D LC**—Near perigee the dependence of atmospheric density upon the height, Z, above the surface of the earth can be approximated by the formula $\rho = \rho_\pi e - (Z - Z_\pi/H)$ where ρ_π = density at height of perigee, Z_π and H = height of a homogeneous atmosphere taken as constant. The application of this relationship to actual computation and the estimate of the possible errors associated with the variability of H with height Z are illustrated. Formulas are derived for computing and r_π and a simplified formula more suitable for computing is presented, namely

$$c\rho_\pi\sqrt{H} = -\frac{2}{3}\frac{(1-e)\sqrt{e}\,\dfrac{d\ln T}{dN}}{(1+e)\sqrt{2\pi r_\pi(1+e)}}$$

where c = ballistic coefficient, e = eccentricity, T = period of rotation, r_π = distance between center of earth and perigee and N = ordinal number of rotation. The results of calculation of ρ_π at different levels are presented in graphs, and in a table from data of the 1957 Sputniks are presented and analyzed. (*Same item as* 11J-98, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere density measurements 2. Satellite density observations 3. Soviet satellites.**—*I.L.D.*

12F-22 551.510.3:551.510.535:551.524.7

Nicolet, Marcel, **High atmosphere densities.** *Science*, Wash., D. C., 127(3310):1317–1320, June **1958.** Also issued as: *Belgium. Institut Royal Météorologique, Contributions*, No. 41, **1958.**

5 figs., 18 refs. **DLC**—This article shows how the concept of the thermosphere must be considered according to the view of CHAPMAN on the extension of the corona toward the earth's atmosphere and according to the atmospheric structure determined by the author, who introduced diffusion distributions for all constituents at altitudes above 110 km. The atmospheric models of the thermosphere that neglect diffusion cannot explain ionospheric and satellite observations. The dissociation of molecular nitrogen cannot be introduced to decrease the mean molecular mass. The oxygen-nitrogen ratio cannot be considered as constant. An atmospheric model must be founded on heat transport such as suggested by CHAPMAN. It is possible to estimate temperatures and temperature gradients in the neighborhood of 500 km and consequently conservative values of densities, if various values of the heat conduction are adopted. (*Same item as* 10.5–199, and 11J–121, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere densities 2. Thermosphere 3. Satellite observations 4. Upper atmosphere temperatures.**—*A.V.*

12F–23 551.510.536:629.19(47):550.

Paetzold, H. K. (*Max-Planck-Inst. für Aeronomie, Inst. für Stratosphären-Physik Weissenau und Technische Hochschule München*), **Einige Ergebnisse aus den Beobachtungen der ersten russischen Erdsatelliten.** [Some results of the observations of the first Russian artificial satellites.] *Raketentechnik und Raumfahrtforschung*, Stuttgart, 2:50–54, April **1958.** 7 figs., table, 4 refs., 8 eqs. Also his: **Weitere Beobachtungen der russischen Erdsatelliten.** [Further observations of the Russian earth satellites.] *Ibid.*, 3(2):45–49, April/June **1959.** 6 figs., table, 14 refs. **DLC, DWB** (629.1388 P126ei). Summary by Heinrich Faust in *Naturwissenschaftliche Rundschau*, Stuttgart, 11(7):274, July **1958. DWB, DLC**—The orbits of the satellites 1957 α_1 and α_2 and β and 1958 are tabulated and briefly discussed. The succeeding theoretical discussion of the state of the upper atmosphere is based on visual and radio signal observations at different locations in Germany. Some of the results are: (1) the density of air at very great heights is by far higher than assumed; (2) the surface at immediate right angle to direction of movement rather than any aerodynamic effects of the shape of a satellite is what should be considered in quantitative evaluation, (3) the impact of colliding air molecules with a satellite is assumed to be "elastic" (i.e., the former sticks before thermally evaporating). Ionospheric radio relationships are also touched upon. The results are presented graphically. The radio signals of this satellite were received for 9 months. The results described concern mainly the propagation of electromagnetic waves in the ionosphere and the structure of the upper atmosphere. (*Same item as* 11J 127, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Satellite observational data 2. Upper air observation techniques 3. Soviet satellites.**—*W.N. & E.K.*

12F–24 551.510.53:551.510.3:551.507.362.

Paetzold, H. K. and Zschörner, H., **Die Dichte der äussersten Erdatmosphäre nach Satelliten-beobachtungen.** [The density of the exosphere according to satellite observations]. *Die Naturwissenschaften*, Berlin, 45(20):485–486, Oct. 15, **1958.** 2 figs., table, 7 refs., 2 eqs. **DLC**—The density of the atmosphere at 200 km has been more exactly observed by artificial satellites. According to Sputnik I and Sputnik II data, the observed density at 225 km was quadruple the value observed by rockets. In a table, the authors give the characteristic data of the satellites, and the evolution of the air density is given after launching of Sputnik I and II. Temporary variations of temperature and density of the high terrestrial atmosphere are to be considered, because there is a fluctuation in the deposits of interplanetary material. The observations show that fluctuation of density over a period of one or more days is not greater than the amplitude of ±20%. (*Same item as* 10.7–97, and 11J–128, *Met. Abs.*) *Subject Headings:* **1. Air density 2. Exosphere 3. Satellite observations.**—*A.V.*

12F–25 551.506.7:551.507.362.2

***Preliminary reports: satellites 1958 Alpha and 1958 Gamma.** *American Geophysical Union Transactions*, 39(4):767–771, Aug. **1958.** 3 figs., table, 8 refs. **DWB, DLC**—Preliminary reports on data gathered by U. S.-IGY satellites 1958 Alpha and 1958 Gamma were made to members of the National Academy of Sciences, the American Physical Society, and the Washington scientific community at a special meeting held May 1, 1958, at the National Academy of Sciences in Washington, D. C. The reports discussed high intensity radiation, micrometeorites, satellite temperatures, and atmospheric densities. (*Same item as* 11J–7, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Satellite data 2. Upper atmosphere densities. 3. U. S. satellites.**—*E.K.*

12F–26 551.510.535:551.507.362.2

Research based on Sputniks I and II reported by Soviets. *Science*, Wash., D. C., 127(3311):1378–1381, June 13, **1958. DLC**—Excerpts from the article **Soviet artificial earth satellites** which the Soviet Embassy, Wash., D. C. released May 19, **1958.** The popular article is based on results

as published in *Pravda*, April 27, 1958. It is stated that scientific papers are to be published in various journals. The highlights may be summed up as follows: The density of the upper layers of the atmosphere at 225–228 km appears to be 5–10 times greater than theoretical values before sputniks. Changes of the state of the atmosphere as dependent on latitude and time of day are assessable. The temperature at 225 km altitude was higher than shown by pre-Sputnik theories and higher than solar influence alone would produce. Determination of electron densities are predictable from known deflection of the radio beam. Cosmic ray particle number was found to increase about 40% from 225 km–700 km altitude. Variation of intensity which is believed to relate to the interplanetary environment near the earth may be checked by the now possible cosmic ray "sounding" of the earth's magnetic field at very great distances from the globe. Electrocardiograms obtained from the first dog in space revealed no morbid symptoms, but the heart beat diminished frequently due to increase of acceleration. The weightlessness in orbit was taken quite well, movements were brief and rather smooth. (*Same item as* 11J–143, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere densities 2. Satellite research 3. Soviet satellites.**—*W.N.*

12F–27 551.524.73

Salamonik, Stanislaw, **Temperatura wyzszych warstw atmosfery.** [Temperature of upper atmospheric layers.] *Gazeta Obserwatora PIHM*, Warsaw, 11(4) (i.e.) No. 124:6–8, April **1958.** 2 figs., 2 tables, eqs. **DLC**—Statement of various (indirect) methods by which temperature of atmosphere at different altitudes is established: 35–60 km (from sound wave anomaly), 60–200 km (meteor-caused ionization, change in atmospheric pressure), 200–400 km (frequency of collision of electrons; concentration of electrons; width of aurora borealis spectra), and above 400 km (sun's spectrum analysis; helium content). Diagrams and tables illustrate change of temperature with altitude and latitude as obtained by various methods. Possible explanations of causes of variation, especially of high temperature at higher altitudes, are considered. *Subject Headings:* **1. Upper air temperature measurement techniques 2. Upper air temperature variations.**—*P. T. Lulov*

12F–28 551.507.362.2:551.510.53:551.510.3

Schilling, G. F. and Sterne, T. E., **Densities of the upper atmosphere derived from satellite observations.** *Smithsonian Institution. Astrophysical Observatory, IGY Project 30.10, Special Report*, No. 12:37–43, April 30, **1958.** fig., tables, 11 refs. **DWB**—Oct. 1957 marked the launching of the first earth satellite. Since then studies of the orbital information have led to the evaluation of the upper atmosphere density at various altitudes. This report gives the numerical values, the results of early calculations, and the portions of model atmospheres between 175 km and 400 km (geometric). It is concluded that the density values furnished by the artificial satellites appear to fall between those furnished by sounding rockets and those by meteor observations. (*Same item as* 11J–140, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere densities 2. Atmospheric models 3. Satellite data.**—*N.N.*

12F–29 551.507.362.2:521.312

Sedov, L. I., **Dinamicheskie effekty v dvizhenii iskusstvennykh sputnikov Zemli.** [Dynamic effects in the motion of artificial earth satellites.] *Iskusstvennye Sputniki Zemli*, Moscow, No. 2:3–9, **1958.** 4 figs., table, 9 refs., 3 eqs. **DLC.** Transl. into English in **Artificial Earth Satellites,** N. Y., Plenum Press, **1960,** Vol. 2:3–11. **DWB**—The theoretical computation of the orbit of an artificial earth satellite and its motion around the center of attraction involves an analysis of the factors acting upon the satellite as a result of the attraction of the earth, and interaction of the moving satellite with the atmosphere and the earth's electromagnetic field. The characteristics of the motion of the satellite as a heavy body relative to the center of gravity can be determined solely by Newton's law of gravity. The orbit of the satellite in the system of coordinates, moving relative to the stars and center of the earth is close to the osculating curve at each point of the revolution. The determination of the osculating ellipse with the focus in the center of the earth is illustrated. The effect of the resistance of the atmosphere on the rotation of the satellite is determined by the formula $W = C_x \rho (Sv^2/2)$ where W = force of resistance directed against the velocity of the center of gravity; ρ = density of the atmosphere; S = total area of outer surface; v = velocity of satellite and C_x = a coefficient depending upon atmospheric temperature, velocity of the satellite, geometrical form of the satellite and interaction of atmospheric molecules and atoms with particles constituting the satellite surface. An additional resistance is produced when a charged satellite moves in the plasma. The effect of W produces secular variations in the orbit; these consist of a decrease of eccentricity lowering of perigee for the osculating ellipse, since the period of rotation diminishes. If the difference of the heights of apogee and perigee is considerably greater than H then the basic effect of acceleration occurs in the small region of perigee where the atmospheric density is a maximum. The aerodynamic effects on rotation of the satellite are close to perigee. The aerodynamic forces produce a slightly perturbed motion. The interaction of the magnetic field of the earth with the metallic satellite

produces in the latter a Foucault current and moments decelerating the rotation of the satellite ne the center of mass. A table giving the values of the parameters of the first three artificial ear satellites of the U.S.S.R. and graphs showing the period of the revolution around the earth as a fun tion of the number of revolutions, the variation of minimum height (perigee) and the variations maximum height (apogee) are presente together with the formula and results of calculations. (*Same item as* 11J–148, Oct. 1960, *Met. Abs Subject Headings:* **1. Satellite orbits 2. Aerodynamic effects 3. Upper atmosphere density measur ments 4. Soviet satellites.**—*I.L.D.*

12F–30 551.507.362.2:521.31

Siry, Joseph W., **The determination of the orbit of 1958-α at the Vanguard computing cente** *IGY, 1957/1958. IGY World Data Center A, Rockets and Satellites, IGY Satellite Report Serie* No. 3:18–23, May 1, **1958.** ref. **DLC**—The Vanguard orbit determination facilities have bee used to determine the orbit of 1958 Alpha, known as Explorer I. This system is described. Pr liminary estimates indicate that the lifetime of the satellite will be about 5–10 yrs and that atmo pheric density in the neighborhood of perigee at about 370 km is approximately 10^{-44} gms/cu cr This is an order of magnitude greater than the value predicted for this altitude by the ARDC mode *Subject Headings:* **1. Satellite orbits 2. Upper atmosphere densities 3. U. S. satellite, 1958 Alph (Explorer I).**—*E.K.*

12F–31 551.510.53:551.510.3:551.507.362

Sterne, Theodore E. (*Smithsonian Astrophy. Obs. and Harvard Univ.*), **High-altitude atmo pheric density.** *Physics of Fluids*, N. Y., 1(3):165–170, May/June, **1958.** 2 figs., table, 17 foot-refs 2 eqs. **DWB**—Atmospheric density values obtained from the motion of artificial earth satellite at altitudes between 186 and 656 km, are discussed. There is some doubt about the reliability densities from satellites because of the effects of ionization and, in the case of nonspherical satellite because of their orientation. Densities inferred from satellites are higher than for the ARDC mod of the atmosphere. These densities are about ten times higher than densities inferred from rocke borne ionization gages between 186 and 230 km. The inference of atmospheric density from rocke borne ionization gages is discussed critically, and densities so obtained are considered to be inferior reliability to the satellite densities. The satellite densities suggest molecular scale temperatur higher than those of the ARDC model in one or more regions of altitude above 80 km. *Subje Headings:* **1. Upper atmosphere densities 2. Satellite uses.**—*Author's abstract.*

1959

12F–32 551.507.362.2:521.312:551.510.53:551.510

Groves, G. V. (*Dept. of Physics, Univ. College, London*), **Air density in the upper atmosphere fro satellite orbit observations.** *Nature*, London, 184 (4681), Supp. No. 4:178–179, July 18, **195** table, 8 refs. **DWB**—From the change of period of a satellite, the density of the atmosphere various perigee heights of the ten successfully launched satellites was derived. The perigee height of 6 satellites have been less than 230 km. The values derived from an analysis of data from thes six satellites are tabulated. The accuracy estimated is of the order of 20% at the lower heights an 50% at the greater heights. Above 300 km Explorer I and Vanguard 1 observations have been th chief sources of air density values. These observations are analyzed and discussed. (*Same item* 11J–61, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Satellite density measurements 2. Upp atmosphere density 3. U. S. Satellites.**—*I.S.*

12F–33 551.507.362.2:551.510.3:551.510.5

Groves, G. V. (*Dept. of Physics, Univ. College, London*), **Determination of upper atmosphere a density and scale height from satellite observations.** *Royal Society of London, Proceedings, Ser. A* 252(1268):16–27, Aug. 25, **1959.** 5 figs., 2 tables, 13 refs. **DWB, DLC**—A solution is obtained fo the rate of change of semi major axis and perigee distance of a satellite orbit with time due to th resistance of the atmosphere. The logarithm of air density is assumed to vary quadratically wit height, and the oblateness of the atmosphere is taken into account. The calculation of perigee a density in terms of the rate of change of satellite period is dealt with; and the method is applied t data at present available on six different satellites. The variation of air density with height obtained as

$$\ln \rho = -28.59(\pm 0.15) - (h-200)/46(\pm 5) + 0.028(\pm 0.013)(h-200)^2/(46)^2$$

for h in the range of approximately 170 to 700 km, where ρ is in grams/cm^3, h is in km and standar deviations are given in brackets. (*Same item as* 11.5 164 and 11J–62, *Met. Abs.*) *Subject Heading*

1. Upper atmosphere density measurement techniques 2. Satellite density measurements.—*Author's abstract.*

12F–34 551.507.362.2:551.510.3:551.510.53

Horn, W., **Die Dichte der Atmosphäre in grossen Höhen, bestimmt aus den Bahnverhältnissen künstlicher Satelliten.** [Density of the upper atmosphere determined from the evolution of the artificial satellite orbit.] *Die Sterne*, Leipzig, 35(1/2):41–43, **1959. DLC**—Some anomalies in the calculations of the Sputnik and rocket orbits are mentioned. To simplify the different calculations, the author considers circles instead of ellipses; he estimates that these irregularities are not of great importance in reckoning the earth's atmospheric density. For the different calculations KEPLER'S law is used. (*Same item as* 10.11–65 and 11J–70, *Met. Abs*) *Subject Headings:* **1. Upper atmosphere densities 2. Satellite observatories.**—*A.V.*

12F–35 550.3:061.3:551.506.22

International Geophysical Year, 1957/1958. IGY World Data Center A [for] Airglow and Ionosphere, **Catalog of Data in World Data Center A, Airglow and Ionosphere, Oct. 30, 1959.** Issued by Central Radio Propagation Lab., National Bureau of Standards, Boulder, Colorado, **1959.** 16 p. **DWB** (M10.535 U585cat)—This catalog of IGY data lists the records on airglow and ionosphere as observed during 1957 through 1959 all over the world. The report covers 20 airglow, 195 ionosphere (vertical incidence, absorption and drift), 22 atmospheric radio noise, 26 whistler, 10 backscatter and 6 noise stations. These data are on file at the U. S. World Data Center A, Boulder, Colo. The catalog lists the cost of reproductions by photostat, verifax, microfilm and other techniques; and includes instructions on how to obtain them. *Subject Headings:* **1. IGY data 2. Airglow observations 3. Ionospheric observations. I. U. S. National Bureau of Standards. Central Radio Propagation Lab.**—*N.N.* Ⓢ

12F–36 551 507.362.2:551 521.67:551 510.53:551 510.3

Jacchia, Luigi G. (*Smithsonian Inst., Astrophysical Obs., Harvard Col. Obs., Cambridge*), **Corpuscular radiation and the acceleration of artificial satellites.** *Nature*, London, 183(4676):1662–1663, June 13, **1959.** 2 figs. **DWB**—The nature of the radiation responsible for the variations of density of the upper atmosphere is discussed. Although the secular accelerations of satellites 1958 Beta 2 and 1958 Delta varied nearly in unison with 10.7 cm radiation from the sun, there is as yet no correlation on the nature of this radiation as revealed in the graphs of the two great geomagnetic disturbances, July 8–9 and Sept. 4, 1958. It is observed that at the time of the July disturbance the latitude of the perigee of 1958 Delta was +35° while that of Sept was +15°. The belief is generally accepted that during a violent magnetic storm the atmospheric layers in the 200-km zone are more strongly affected that at a height of 600–700 km. *Subject Headings:* **1. Satellite acceleration 2. Corpuscular radiation 3. Upper atmosphere densities.**—*N.N.* Ⓢ

12F–37 551 507.362.2:551 510.3:551 510.536

King-Hele, D. G., (*Royal Aircraft Estab., Farnborough*), **Density of the atmosphere at heights between 200 KM and 400 KM, from analysis of artificial satellite orbits.** *Nature*, London, 183(4670): 1224–1227, May 2, **1959.** 2 figs., 2 tables, 26 refs., 7 eqs. **DLC**—The article summarizes the previous methods of estimating the action of atmospheric drag which makes the orbit of an earth satellite contract. The methods previously used in estimating this air density are difficult because the effective cross-sectional areas and drag coefficients of the satellites are difficult to determine exactly. In the present article values of the density have been derived from all the ten satellites launched up to the end of 1958. Since their orbits are known it has been possible to treat the satellites' data consistently. This is a more accurate method of determining the air density values at certain heights near the perigee. (*Same item as* 11J–90, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere densities 2. Satellite density measurements.**—*N.N.* Ⓢ

12F–38 551 507.362.2:551 510.53:551 510.3

†King-Hele, D. G. (*Royal Aircraft Estab., Farnborough*), **Density of the upper atmosphere from analysis of satellite orbits; further results.** *Nature*, London, 184 (4695):1267–1270, Oct. 24, **1959.** 2 figs., 2 tables, 23 refs., 6 eqs. **DWB**—The article describes a refined method of determining air density from the rate of contraction of satellite orbits. The data are taken from the satellite experiments of 1959 at a height of 180–800 km. The decrease in the orbital period can be measured by the integrated effect of air drag around the orbit. The experiments show that the density at a given height below 300 km does not depart from its average value by a factor of more than 1.5 as a result of latitude variations. Density at 200–250 km is higher on the sunlit half of the earth than on the darker half. (*Same item as* 11J–91, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere densities 2. Satellite density measurements.**—*A.H.K.*

12F–39 551 511:551 524.7:551 510

Kondrat'ev, K. Ia. and Filipovich, O. P., **K teorii teplovogo rezhima verkhneĭ atmosfer** [Theory of the thermal regime of the upper atmosphere.] *Meteorologiia i Gidrologiia*, No. 12:41–4 Dec. **1959.** 5 figs., 2 tables, 42 refs. **DWB, DLC**—Vertical distribution of temperature in differer atmospheric regions (troposphere, stratosphere, mezosphere, thermosphere, exosphere and ionospher described in the works of many investigators given in 42 references, are reviewed and analyzed i respect to thermal characteristics of each region. The results of the theoretical analysis are compare with practical observations with rockets and satellites and noted variations (discrepancies) a interpreted in respect to conditions outlined in each particular work. The distribution of tempera ture at various altitudes is given in tables and charts. This distribution varies not only with altituc but also with seasons and latitude. The first maximum temperature is found at an altitude of 50 kr and first minimum at 80 km. At altitudes above 100 km the temperature is again higher. Th evaluation of temperatures at altitudes above 100 km was made on the basis of the spectroscopic an ionospheric observations and also with theoretical considerations on the velocity of helium dissipatio and radiational equilibrium. Spectroscopic studies were carried out in three directions: (1) dete mination of the kinetic temperature by means of Doppler broadening, (2) vertical distribution c aurora borealis and (3) distribution of the intensity of the rotational and vibrational lines in molecul spectra. The last method is considered as the most reliable one. Upper atmospheric heating related to absorption of infrasound waves by the atmosphere and is partly due to nonobservabl ionization and dissociation. *Subject Headings:* **1. Upper air temperature distribution 2. Vertica temperature distribution 3. Heat balance of atmosphere 4. Temperature stratification.**—*N.P.S.* (

12F–40 551.510.53

†Nicolet, Marcel (*Royal Met. Inst. Uccle, Belgium*), **La thermosphère.** [The thermosphere. *Annales de Géophysique*, Paris, 15(1):1–22, Jan./March, **1959.** 8 figs., 4 tables, 34 refs., 38 eqs French and English summaries p. 1–2. **DLC.** Also reprinted as: *Belgium. Institut Royal Météor logique, Contributions*, No. 48, **1959.** 22 p. 8 figs., 4 tables, 34 refs. **DLC**—An analysis of th pressure measurements below 120 km shows that there is an extreme minimum of temperature at th mesopause and that the temperature at the bottom of the thermosphere is as low as $150 \pm 20°K$. An examination of the interrelationships between photodissociation and recombination of oxyge reveals that the conventional hypothesis dealing with a constant oxygen-nitrogen ratio cannot b used for the thermosphere. Since all atmospheric models employ a law of vertical distribution of th mass density $\rho = 1.3n(N_2)m(N_2)$, the physical properties of the lower thermosphere have bee modified. It has been shown that atomic oxygen concentration can reach values between 50% an 100% of the molecular nitrogen concentration at 100 km and 110 km, respectively. These tw extreme values, differing only by a factor of two, lead to a variation of the mass density completel different from previous analyses. In order to use only one model for computations, $n(0) = \frac{1}{2}n(N_2$ has been assumed at 110 km and above that height it is found that all constituents are in diffusiv equilibrium. Using the general criterion of the diffusion time, defined by MANGE to give time corresponding to the same percentage concentration change at all altitudes, it is shown that time corresponding to a change from a mixing distribution to a diffusion distribution can be found Diffusion of all constituents from the mixing state is completed in about one day when it begins a 120 km and needs at least one week when it begins at 100 km. Therefore, neglecting a transitio region, vertical distribution subject to diffusion was adopted at 110 km. Assuming that there is a energy flow descending as heat in the upper part of the thermosphere according to CHAPMAN' theory, the temperature distribution is determined in a steady state by downward conduction i atomic oxygen. Results of computations are given up to 500 km showing how the density varying according to energy fluxes varying between 0.1 erg cm^{-2} sec^{-1} and 1 erg cm^{-2} sec^{-1}. The effect o atomic hydrogen has not been considered because it is assumed that its role is not very importan below 1000 km. A final indication has been made in connection with the dissociation of molecula nitrogen. It is shown that nitric oxide and atomic nitrogen are interrelated and atomic nitroge remains a minor constituent which does not affect the atmospheric mean molecular mass. (*Same ite as* 10.10–210, Oct. 1959, *Met. Abs.*) *Subject Headings:* **1. Thermosphere 2. Mesopause temperatur 3. Temperature distribution 4. Oxygen dissociation 5. Thermospheric diffusion.**—*Author' abstract.*

12F–41 551.510.536:551.524.7

†Nicolet, Marcel, **The constitution and composition of the upper atmosphere.** *Institute of Radi Engineers, N. Y. Proceedings*, 47(2):142–147, Feb. **1959.** table, 35 refs., 20 eqs. **DLC**—A genera survey is made of various observations and theoretical possibilities which concern the problem involved in the study of the constitution and composition of the upper atmosphere. The basic problem of the composition of the homosphere and heterosphere is studied after considering the nature of dissociation processes and vertical transport by diffusion. Finally, the effect of therma

conduction on the temperature distribution is shown to be of importance over the entire thermosphere above the E layer. Analysis of satellite observations show that densities between 200 km and 800 km may have a vertical distribution as follows:

Altitude (km)	200	300	400	600	800
Density (g cm^{-3})	6×10^{-13}	6×10^{-14}	8×10^{-15}	5×10^{-16}	8×10^{-17}

(*Same item as* 11.10–262, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere composition 2. Photochemistry of upper atmosphere 3. Aeronomy 4. Thermosphere 5. Upper atmosphere densities.**—*Author's abstract and A.V.*

12F–42 551.510.536

†Paetzold, H. K., **Erforschung und Zustand der höchsten Atmosphäre oberhalb der Ionosphäre.** [Exploration and state of the highest atmosphere above ionosphere.] Reprint from *Physikertagung*, Munich, p. 63–82. [1952–] 13 figs., 5 tables, 24 refs.—The Earth's atmosphere is bounded by the earth's surface and by the interplanetary space with its very slight mass density. The atmosphere is classified according to its thermal state above the tropopause. A maximum is reached in the mesosphere (280°K) at 45 to 50 km, but the expected second maximum at 300–400 km is very probably not reached because in this height the free path lengths of the molecules and atoms are no longer small in comparison to the extension of the atmosphere. The altitude at which this occurs is termed the critical height, which delimits the exosphere from the thermosphere. The author summarizes present knowledge on the electron density and temperature in interplanetary space, the composition of the atmosphere and temperature distribution at the critical height, temperature density, energy balance, disappearance of gases in the inner exosphere, the H-atoms in the outer exosphere and the use of whistlers as a probe of the exosphere. (*Same item as* 11.8–179, Aug. 1960, *Met. Abs.*) *Subject Heading:* **1. Exosphere.**—*I.L.D.*

12F–43 551.510.3:551.510.53:551.507.362.2

Paetzold, H. K. and Zschörner, H., **Über Dichteschwankungen der höchsten atmosphäre nach Satellitenmessungen.** [Density variations of the highest atmosphere according to satellite measurements.] 4 p. 3 figs. Reproduction of typescript [1959]. **DWB** (629.1388 P126ub)—Observations of satellites Explorer V, Sputnik III and Vanguard I at the Telefunken Co. (20 Mc) and elsewhere show that the density of the air during the day is 20% higher than at night at 225 km, with extreme values in the evening and the morning, respectively, and the density also decreases from the high latitudes to the equator. Relation of density to solar activity, magnetic storms, solar UV, etc., are also considered but not established, and data are presented graphically to illustrate. (*Same item as* 11J–130, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Satellite density observations 2. Upper atmosphere densities 3. Soviet satellite, 1958 Delta (Sputnik III) 4. U. S. satellite, 1958 Beta (Vanguard I).**—*M.R.*

12F–44 551.510.3:551.510.53 551.510.535:551.594.12:551.510.62

Paetzold, H. K. (*Max-Planck-Institut für Aeronomie, Institut für Stratosphären-Physik, Weissenau and T. H. München*), **Die höchste Atmosphäre und der Weltenraum.** [The highest atmosphere and the cosmos.] *Umschau*, Frankfurt a.M., 59(1):3–6, Jan. 1, 1959. 5 figs., table. **DLC**—The audibility of the Sputnik radio signals of 20 MHz and 40 MHz indicated that the radio waves were refracted in the ionosphere; this is possible only when the electron density does not fall below a value of 1.10^6 electrons/cm^3 in the maximum of the ionosphere at a height of 300 km. At greater altitudes the electron density diminishes much more gradually than the atmospheric density. The relative ionization gradually increases with altitude from 0.05% at 300 km to 7% at 1000 km. From the Faraday frequency perceptible in the satellite signals it was possible to compute an electron density of 5.10^5 electrons/cm^3 at 500 km. The temporary and irregular fading indicates the existence of ionospheric inhomogeneities. Duration of fading of several minutes to several seconds indicated horizontal variations of electron density extending from 2000 km to 100 km. The satellite became inaudible over higher latitudes at relative close distance while from the south it was audible at great distances; this indicates the influence of the Polar ionosphere which is more disturbed by incursion of corpuscle clouds than in lower latitudes. The shorter life of the satellites as a result of deceleration indicates that atmospheric densities above 200 km are higher than hitherto expected. These higher densities signify higher temperatures in the upper atmosphere. At 200, 350 and 1000 km the temperatures were 800, 2000 and 2500°K, respectively. The composition of the atmosphere comprises a density of 100 nitrogen molecules/cm^3 and 1×10^6 oxygen atoms/cm^3, and 0.1% atomic hydrogen at about 80 km. At 1000 km there are still 10^5 H-atoms/cm^3 and at 3000 km 1000 H-atoms/cm^3 may be present. At the high temperatures of the exposure H-atoms are no longer stable but evaporate into the cosmos. Atmosphere density is greater by day than at night; variations in density amounting to a factor of 10 result from a warming up of the high atmosphere. The frequency

of meteorites impinging upon the satellite was 1 meteorite/100m² sec for meteorites 4 in diamete with increasing size the frequency diminished by a factor of 10. The cosmic radiation was extra ordinarily high; at 1000 km it was 1000 times greater than the normal cosmic radiation. The radia tion particles were protons. The maximum of radiation is apparently at 10,000 km and above th height it diminishes. The origin of the radiation belt is discussed. (*Same item as* 11J–129, Oct. 196 *Met. Abs.*) *Subject Headings:* **1. Ionospheric radio wave refraction 2. Ionospheric ionizatio 3. Satellite observation of the upper atmosphere 4. Upper atmosphere densities.**—*I.L.D.*

12F–45 551.507.362.2:551.510.5

†Paetzold, H. K., **Die oberste Erdatmosphäre nach Satellitenmessungen.** [The upper atmos phere seen from satellite observations.] *Die Naturwissenschaften*, Berlin, 46(13):416–422, July 1 **1959.** 7 figs., 3 tables, 46 refs. **DLC**—With the aid of artificial earth satellites, it is possible t study the ionosphere situated above the F2-peak level. In particular, the frequencies used in th Soviet satellites (20 and 40 Mc/s) gave interesting results according to which the electron densit seems to decrease slowly above the F2 layer. Fading observed in the reception of these radio signa indicates the presence of heterogeneities in the ionization, particularly in the Polar zones. For th explanation of a kind of periodic fading, it is necessary to consider the rotation of the satellite and c the antennae and also the influence of the geomagnetic field. Temperature and density values c the upper atmosphere can be deduced from the observation of the deceleration of artificial satellites The temperature at 1000 km is in the range of 2000°K, a value suitable to explain the escape of helium Oscillations of the value of the deceleration are associated with local variations of density and tem perature. The discovery of the Van Allen radiation belts, where particles are trapped in the geo magnetic field, is due to the cosmic ray equipment of earth satellites. The Argus Experimen (explosion of A bombs at an altitude of 500 km) showed the possibility of creating temporary radiatio belts observed between the two natural belts by satellites then in orbit. (*Same item as* 11.2–8 and 11J–132, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere 2. F layers 3. Electron densit 4. Satellite observations.**—*A.V.*

12F–46 551.501.7:535.853:551.510.5

Schaefer, Edward J., **Upper-atmosphere structure measurements.** Michigan. University [Engineering] Research Institute, Contract NASw-e, Final Report, Dec. **1959.** 74 p. 42 figs (incl. photos), 7 tables, 18 refs., numerous eqs. **DWB** (M(051) M624re)—The theory of operation of and the experimental results obtained from, two types of mass spectrometer, the massenfilter and th omegatron, are presented. It is concluded that the massenfilter exhibits some significant advantage over the omegatron as well as other types of mass spectrometers previously used in upper atmospher research. At comparable resolutions, these advantages include simplicity of construction, ability t operate in higher densities, and operation which is relatively independent of ionic energies. Thi latter leads to spectra uniquely related to the gas under analysis and interpretation of results i simplified. Elimination of the magnetic field reduces weight as compared with the omegatron an conventional spectrometers. Obtainable sensitivity in terms of ion current per unit pressure an unit electron beam current should be comparable to the Bennett tube. Inasmuch as one of the objec tives is to measure the extent of dissociation in the ambient atmosphere, it is necessary to eliminat collision processes with the apparatus in which recombination is likely to occur. A preliminary io source design for the massenfilter is described in which this probability is reduced to an acceptabl value. A separable instrument package, designed to avoid outgassing and recombination problems is described. *Subject Headings:* **1. Upper atmosphere structure 2. Spectrometers.**—*Author' abstract.*

12F–47 551.507.362.2:551.510.5

Schmidt, K. H., **Der Dichteverlauf in der hohen Erdatmosphäre.** [Distribution of density i the high terrestrial atmosphere.] *Die Naturwissenschaften*, Berlin, 46(4):138, Feb. **1959.** fig. 3 refs. **DLC**—Observation of artificial satellites made it possible to determine the density in the high terrestrial atmosphere. The author comments on the density established by T. E. STERNE and G. F SCHILLING after observation of 1957 Alpha, 1957 Alpha 2 and 1957 Beta. The established densitie are shown in a figure and commented upon. (*Same item as* 10.10–96, Oct. 1959 *Met. Abs.*) *Subjec Headings:* **1. Upper atmosphere densities 2. Satellite observatories.**—*A.V.*

12F–48 551.507.362.2:551.510.3:551.510.53

Siry, Joseph W. (*U. S. Naval Res. Lab. now, Goddard Space Flight Center, Wash., D. C.*), **Satellite orbits and atmospheric densities at altitudes up to 750 km obtained from the Vanguard Orbit Determination Program.** *Planetary and Space Science*, N. Y., 1(3):184–192, Aug. **1959.** 10 figs., 3 tables 8 refs. Also in: *International Astronomical Union, Transactions*, 10:720–722, **1958.** 2 figs., 3 refs **DWB**—Data collected and analyzed by the Vanguard Orbit Determination Program are discussed

tabulated, and graphically represented. They pertain mainly to the determination of the orbits and artificial earth satellites and to the air density at a very high altitude. The orbit determination systems of Vanguard I and Explorer III are described. It is noted that the best estimate of the overall performance of the entire orbit determination system, including the minitrack observing system and the orbit computing system is obtained by analysis of the orbit of the Vanguard satellite, 1958 Beta 2. It is further reported that a significant measure of air density at a very high altitude was obtained from the orbital data for the satellite 1958 Beta 2, Vanguard I. Mathematical approach is adopted to analyze the pycnometric level for the Vanguard satellite. It is suggested at the same time that an analysis of the Vanguard satellite orbital data can also be made by means of an approach in which an appeal to the physical theory is made. (*Same item as* 11J–159, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Satellite orbits 2. U. S. satellite 1958 Beta (Vanguard I) 3. U. S. satellite, 1958 Gamma (Explorer III) 4. Upper atmosphere density measurements.**—*I.S.*

12F–49 551.510.3:551.510.536:551.507.362.2

Tuomikoski, P. (*Helsinki Univ.*). **Pressure and molecular scale temperature in the upper atmosphere.** *Geophysica*, Helsinki, 7(1):51–54, **1959.** 3 figs., table, 13 refs., 4 eqs. **DWB, DLC**—Consistent and reliable average values for air density at heights between 200 km and 1000 km have been deduced from the motions of artificial satellites. The density and pressure at 1000 km are so low that an integration of the hydrostatic formula will lead to pressure values which rapidly gain in reliability as the lower limit of integration becomes smaller. Estimated average temperatures are shown as a function of altitude. *Subject Headings:* **1. Upper atmosphere density data 2. Upper air pressure 3. Satellite air density measurement techniques 4. Satellite density measurements.** —*E.Z.S.* Ⓢ

1960

12F–50 551.510.536

Chapman, Sydney, **The thermosphere: the earth's outermost atmosphere.** (In: Ratcliffe, J. A. (*ed.*), **Physics of the upper atmosphere.** N. Y., Academic Press, **1960.** p. 1–16. fig., 14 refs., eqs.) **DWB** (M10.5 R233ph)—The discussion in this chapter is divided into two sections. A descriptive outline of the Earth's atmosphere is presented in the first section. Here progress in man's understanding of the atmosphere is traced, the mesopause and thermosphere are explained, and dissociation, chemical reactions and luminous emission in the atmosphere are examined. This section also includes a description of the ionosphere and of the hypothetical isothermal exosphere. The boundary between the Earth's atmosphere and the solar corona is the subject of the second section. The discussion includes a description of the Sun and of the heat flow into the Earth's atmosphere from the interplanetary gas. Also explained are the solar and coronal "constants" of energy supply and the nature of the Earth's outermost atmosphere. *Subject Headings:* **1. Thermosphere 2. Outer atmosphere structure.**—*I.S.* Ⓢ

12F–51 551.510.53:551.507.362.1:523.74/5

Faust, Heinrich, **Raketen im Dienst der Höhenforschung.** [Rockets in upper atmosphere research.] *Weltraumfahrt*, Frankfurt a.M., 11(2):43–46, June **1960. DLC**—Rocket research of the upper atmosphere considers: a) atmospheric structure, composition etc. and b) extraterrestrial effects on the atmosphere. The rockets involved in scientific research operate between 40–300 km altitude. The author points to various unsolved problems such as: the upper limit of the reverse vertical motion above the null layer; the altitude and extension of the low and high pressure areas, determining our weather conditions, etc. The significance and usefulness of the new knowledge in the field of science, economy and everyday life are discussed. Regular synoptic high altitude rocket observations are suggested, with additional rockets to investigate outstanding solar events. *Subject Headings:* **1. Rocket research 2. Upper atmosphere structure 3. Upper atmosphere composition 4. Solar phenomena.**—*E.K.* Ⓢ

12F–52 551.510.536:551.507.362.2

Gilvarry, J. J. (*Allis-Chalmers Manufacturing Co., Milwaukee*), **Physical parameters of the atmospheric escape layer.** *Nature*, London, 188(4753):804–805, Dec. 3, **1960.** fig., table, 6 eqs., 12 refs. **DWB**—This communication reports the results of estimates of the physical parameters of the escape layer using data obtained by observation of satellite orbits. There are marked diurnal variations. The product of the number density of atmospheric particles with the scale height is found to show an increasing diurnal effect above a height of 300 km. This gives rise to a variation in the critical level from 670 km in the day to 480 km at night. The estimated temperatures vary from 2000°K by day to 1000°K by night. The conclusion is reached that if more refined data were available then seasonal and latitudinal variations might also be expected. *Subject Headings:* **1. Escape layer 2. Upper air temperatures 3. Upper air densities 4. Satellite data.**—*R.B.* Ⓢ

12F–53 551.501.71:551.510.53:551.510.3:551.507.362.

Jacchia, Luigi G., **Effect of a variable scale height on determinations of atmospheric density fro satellite accelerations.** *Smithsonian Institution. Astrophysical Observatory, Special Report*, No. 4 July 11, 1960. p. 1–4. 2 figs., table. **DWB**—Formulas for the determination of atmospher densities from satellite accelerations assume that the scale height is constant at heights immediatel above perigee. The error of these formulas is evaluated for an atmosphere in which, from a repr sentative value at Perigee, the density scale height increases linearly with height at different rate (*Same item as* 11J–76, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Density gradient in upper a mosphere 2. Satellite acceleration.**—*Author's abstract.*

12F–54 551.511.12:551.510.3:551.507.362.

Jacchia, Luigi G. (*Smithsonian Inst. Astrophysical Obs. Camb., Mass.*), **A variable atmospheric density model from satellite accelerations.** *Journal of Geophysical Research*, Wash., D. C., 65(9) 2775–2782, Sept. 1960. 3 figs., 3 tables, 14 refs., 10 eqs. **DLC.** Also issued in *Smithsonian Institu tion. Astrophysical Observatory, Special Report* No. 39, March 30, 1960. 15 p. 3 figs., 3 table 8 refs., 10 eqs. **DWB**—The analysis of satellite accelerations leads to an empirical formula tha relates the product $\rho H^{\frac{1}{2}}$ (ρ =atmospheric density, H =scale height) to the geometric height z, th 20-cm solar flux F_{20}, and the angular distance ψ from the center of the diurnal bulge. Once th numerical parameters of this formula have been established, tables of ρ and H are computed and separate formula is derived to represent ρ in function of the same variables. *Subject Heading* **1. Atmospheric models 2. Satellite air density measurement techniques.**—*Author's abstract.* Ⓢ

12F–55 551.507.362.

Jastrow, R. and Bryant, R. (*both, NASA, Wash., D. C.*), **Variations in the orbit of the Ech satellite.** *Journal of Geophysical Research*, Wash., D. C., 65(10):3512–3513, Oct. 1960. 2 figs 4 refs. **DLC**—Report of variations in the orbit of Echo Satellite. Echo satellite was launched by th NASA on Aug. 12, 1960, into a circular orbit with an inclination of 47° and with perigee and apoge altitudes of 1500 and 1700 km, respectively. Analysis of the first tracking data indicated that it orbit shows a substantial radiation pressure effect. The orbit variations produced by radiatio pressure are 300 times larger than those occurring in Vanguard I and a relatively precise measuremen is possible. Information on the rate of change of period of the Echo orbit makes it possible t determine the mean value of the density of the atmosphere at the perigee altitude of 1518 km. Th derived density at 1500 km. is close to the predictions of a model developed by JASTROW and KYL (in press.) The Echo results fix the rate of change of period at .0024 min/day which corresponds to mean density of 1.1×10^{-18} g/cm^3. *Subject Headings:* **1. Satellite orbits 2. Satellite air densit measurements 3. U. S. satellite, 1960 Echo.**—*E.Z.S.* Ⓢ

12F–56 551.594.51:535.33:546.1

Jones, A. Vallance and Hunten, D. M. (*both, Univ. Saskatchewan*), **Rotational and vibrationa intensity distribution of the first negative N_2^+ bands in sunlit auroral rays.** *Canadian Journal o Physics*, Ottawa, 38(3):458–476, March 1960. 7 figs., table, 35 refs., 11 eqs. **DWB, DLC**—Spectra of sunlit auroral rays were obtained from Saskatoon during the auroras of September 3/4 and 4/5 1958. The resolution of these spectra was sufficiently high to enable measurements to be mad of the relative intensities of the lines of the O–O first negative N_2^+ band as well as the relative in tensities of bands of the $\Delta v = -1$ sequence of this system. An analysis of the rotational line in tensities shows they are consistent with an excitation process in which N_2^+ ions in thermal equilibriu with the atmosphere at 2200°K fluoresce under the influence of solar radiation. The vibrationa intensity distribution also is consistent with a fluorescent excitation from a state of thermal equi librium at about 2050°K. It is shown that the results are not consistent with a fluorescent excitatio process in which the rotational and vibrational degrees of freedom of the N_2^+ ions come into radiativ equilibrium with the solar radiation. Earlier conclusions that radiative equilibrium did hold fo vibration are shown to be in error as a result of the high rotational temperature and the low dispersio used. It is concluded that the destruction of N_2^+ ions as a result of dissociative recombination pro ceeds sufficiently fast to prevent any significant approach to radiative equilibrium. This investiga tion provides a strong indication that the kinetic temperature of a sunlit auroral ray (perhaps in th 400–500 km region) is in the neighborhood of 2000°K. This may be somewhat higher than th temperature of the normal atmosphere at this height. (*Same item as* 11.10–173, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Sunlit auroral spectra 2. Auroral nitrogen bands 3. Auroral temperatures.**— *Authors' abstract.*

12F–57 551.510.53:551.507.362.

Kaiser, T. R., **Progress in aeronomy.** *Nature*, London, 188(4742):712–713, Nov. 26, 1960 **DLC**—A symposium on aeronomy was held at Copenhagen during July 19–22 to survey recen

advances on the physics of the upper atmosphere. The main subjects discussed were: the reduction of orbital data of satellites to yield atmospheric densities at heights up to 700 km, solar ionizing radiation, the importance of diffusion in connection with the distribution of both neutral and ionized constituents of the high atmosphere, collision processes and atmospheric emissions, the spectra of atmospheric emissions and the temperature of the upper atmosphere, solar and terrestrial disturbance and the influx of interplanetary dust. The substance of the various papers is outlined briefly. *Subject Headings:* **1. Aeronomy conferences 2. Upper atmosphere physics 3. Satellite orbit data.**—*R.B.* Ⓢ

12F–58 551.510.53:551.507.362.1:551.507.362.2

†Kallmann, H. Korf (*Rand Corp., Santa Monica, Calif.*), **Upper atmosphere properties based on rocket and satellite data.** *International Symposium on the Physics and Medicine of the Atmosphere and Space, San Antonio, Texas, Nov. 1958, Proceedings of the 2nd Symposium*, pub. N. Y., John Wiley, **1960.** p. 100–111. 5 figs., 2 tables, 26 refs., 6 eqs. **DWB** (M86:612 1612ph), **DLC**—The upper air densities that have been obtained from satellites are discussed. In general, the densities obtained from satellite data are higher than those previously assumed. The method used in deriving atmospheric properties is based, in principle, on the perfect gas law and the hydrostatic equation, which relate density, pressure, temperature, and molecular weight as functions of altitude. In this investigation, the variation of pressure with height was derived from the variation of density with height by numerical integration, without assuming a scale-height or temperature gradient. The discussions indicate the difficulties and uncertainties involved in deriving a model atmosphere from the data available now. Preliminary values for atmospheric properties from 60–800 km are listed. It is concluded that the upper atmosphere properties derived from densities are fairly accurate and consistent up to an altitude of 500–600 km. Above that height the uncertainty of the values increases with altitude. *Subject Headings:* **1. Upper atmosphere density measurements 2. Upper air pressure variations 3. Satellite data.**—*E.Z.S.* Ⓢ

12F–59 551.507.362.2:521.312:551.510.53:551.510.3

King-Hele, D. G. and Walker, (Mrs.) D. M. C. (*both, Royal Aircraft Establishment, Farnborough, Hants*), **Variation of upper atmosphere density with latitude and season: Further evidence from satellite orbits.** *Nature*, London, 185(4715):727–729, March 12, **1960.** 3 figs., 11 refs. **DWB**—Observations obtained from satellite orbits proved that solar disturbances are the main factor influencing the air density at heights of 200–300 km, giving rise to variations which have an amplitude of about ±20% and a periodicity of about 28 days. Day to night changes may also possibly have an effect; with the density not more than 10% above average by day, variations of air density with latitude and seasons were found small. At 300–700 km the variation from day to night has a greater amplitude than the 28-day variation due to solar disturbances. The values of density deduced from the orbit of Sputnik III, Sputnik III rocket, Discoverer VI and Explorer IV are presented in attached figures. (*Same item as* 11J–92, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Solar effects on upper atmosphere density 2. Upper atmosphere density variations 3. U. S. satellites 4. Soviet satellites.**—*E.K.*

12F–60 551.507.362.2:551.510.53:551.510.3:521.312

King-Hele, D. G. and Walker, (Mrs.) D. M. C. (*both, Royal Aircraft Establishment, Farnborough*), **Density of the upper atmosphere and its dependence on the sun, as revealed by satellite orbits.** *Nature*, London, 186(4729):928–931, June 18, **1960.** 2 figs., 2 tables, 19 refs., 2 eqs. **DWB**—The study gives revised values for air density at heights between 180–700 km, deduced from satellite orbits, up to March 1960, and describes new features of the upper atmosphere. The wide variation of density between midnight and midday at heights above 500, which had previously been noted for one satellite, has now shown itself for five other satellites at heights between 180 and 250 km. The average air density seems to have decreased appreciably by perhaps 20% between 1958 and 1960. Since it is known that day-to-day variations in air density depend on solar activity, this change is interpreted as the beginning of an 11-yr cycle with maximum density occurring at the sunspot maximum in 1957–58. At a height above 250 km this effect should be more prominent. (*Same item as* 11J–93, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere density variations 2. Satellite density measurements 3. Solar effects on upper atmosphere density.**—*E.K.*

12F–61 551.507.362.2:551.510.3:551.510.536

King-Hele, D. G. (*Royal Aircraft Establishment, Farnborough*), **Some discoveries from satellite orbits.** *The New Scientist*, London, 8(207):1193–1196, Nov. 3, **1960.** 4 figs. **DLC**—Variations of air densities at heights from 200–700 km, as determined by observations of the motion of satellites, are discussed. The diurnal variation is small at heights of 200–300 km but becomes important above 300 km. At 550–600 km the maximum daytime value, occurring an hour or two after midday,

is about 10 times greater than the minimum value, occurring after midnight. The density patter infers a temperature of about 700°C from 300–600 km at night and temperatures varying fro 1000°C at 300 km to 1700°C at 600 km by night. The air density also experiences an approximatel cyclic variation with a period of about 28 days. It is inferred that these variations are closel linked with solar disturbances. Seasonal and latitudinal variations are small. *Subject Heading* **1. Satellite orbits 2. Upper atmosphere densities 3. Upper air temperatures.**—*R.B.*

12F–62 551.507.362:551.510.5

Krasovskiĭ, V. I. (*Inst. of Physics of the Atmosphere, Academy of Sciences of the U.S.S.R.*) **Results of scientific investigations made by Soviet Sputniks and cosmic rockets.** *Astronautica Act* Vienna, 6(1):32–47, **1960.** 15 figs., table. English, German and French summaries p. 32. **DWB**— A survey is given of the results of Soviet investigation carried out by means of cosmic rockets an artificial satellites and in connection with it, hitherto unpublished information is given on measure ments in the upper atmosphere and in cosmic space. The density of the atmosphere was foun higher than expected. The density was greater by day than by night, greater in the Polar than in ti equatorial regions. Atmospheric ions were determined with a spectrometer. Upper atmosphe above 250 km showed an atomic structure. Intensities of cosmic rays were found to be a function c geomagnetic latitude. Hard ionized particles showed essential qualitative and quantitative diffe ences between the equatorial and the polar zones. Powerful flux of the electrons was discovered i the upper atmosphere. Anomalies within the geomagnetic field were observed. The photo effec in the photomultiplier registered x-rays of energy of tens and hundreds kev. The piezo-electri elements registered micrometers. It was established that the magnetic field close to the surfac of the moon does not exceed 50–100γ. (*Same item as* 11J–96, Oct. 1960, *Met. Abs.*) *Subject Head ings:* **1. Upper atmosphere density measurements 2. Upper atmosphere properties 3. Sovie satellites 4. Soviet cosmic rockets 5. Lunar magnetic field.**—*E.K.*

12F–63 551.507.362.2:551.510.53:551.510.

Martin, H. A. and Priester, W. (*both, Sternwarte der Universität, Bonn*), **Measurement of sola and diurnal effects in the night atmosphere by artificial satellites.** *Nature,* London, 185(4713):600 601, Feb. 27, **1960.** 3 figs., 6 refs. **DWB**—A method is presented to separate the diurnal fluctua tions from those of solar radiation in order to distinguish these effects in the high atmosphere b artificial satellites. The geocentric angular distance perigee sun was used in comparison with th satellite data supposing the atmospheric density to be dependent on the differential of night ascensio of declination and the geocentric latitude of the perigee. In order to separate the diurnal effect fo the satellite 1958 β2 the atmospheric density data were reduced to a standard value of the solar 20 cr radiation. The lines of constant density were determined by drawing the resulting values in coordinate-system of differential night ascension and differential declination. The seasonal and th terrestrial effects being superposed, were deduced. Dependence of atmospheric density on nigh ascension is evident in the diurnal effects in the equatorial zone. A density model with solar an diurnal fluctuations for altitudes of 210, 350 and 660 km shows a large density fluctuation betwee day and night, suggesting a daily up and down movement of the atmosphere. These movements decreasing with decreasing altitudes down to 200 km and becoming here insignificant compare with the fluctuation caused by solar radiation, indicate the origin of the latter in a layer below 200 km This suggests that the absorption of solar X-ray radiation is responsible for these movements in th E layer of the ionosphere. The scale heights of the atmosphere and the ratio of temperature to mea molecular weight changes with the time of the day but very little with the flux of 20 cm radiatio as shown by an equation. The diagrams illustrate the derivation of this result of the analysis (*Same item as* 11J–104, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Solar radiation measuremen 2. Upper atmosphere density 3. Diurnal variations.**—*O.T.*

12F–64 551.510.53:551.524.7:551.510.

Mathur, S. B. and Mitra, A. P. (*both, National Physical Lab., New Delhi*), **The upper atmospher and outer space, Pt. I, densities, temperatures and concentrations of atmospheric constituents fron 130 to 1000 km.** *Journal of Scientific and Industrial Research, Sec. A* New Delhi, 19(7):311–317 July **1960.** 5 figs., 6 tables, 16 refs., 12 eqs. **DWB, DLC**—On the basis of the values of atmospheri densities that have recently been inferred both in the U. S. and in U.S.S.R. from observations o satellite drag, a self-consistent atmospheric model has been developed over the height range 130 1000 km. The data are found to be consistent with scale height, increasing with an approximat gradient of 0.166 up to about 650 km, and remaining constant about this height. Atmospheri density is found to be considerably larger than that in the Rocket Panel model, but is close to th model given earlier by S. K. Mitra (The Upper Atmosphere, 1952). The concentration of atomi oxygen, which forms the bulk of the total particle concentration at a height of 1000 km, is as high a $4 \times 10^6/cm^3$. The atmospheric temp. rises from a value of 462°K at 130 km to a value of abou

2000°K at 600 km and remains 2000°K above this height. The mean molecular mass drops from a value of 22.6 at 130 km to its minimum value of 16.0 at 450 km. *Subject Headings:* **1. Upper air temperatures 2. Upper atmosphere densities 3. Atmospheric structure.**—*Authors' abstract.* Ⓢ

12F–65 551.507.362.2:551.510.53:061.6

Mitra, S. K. (*Pres., Natl. Inst. of Science of India*), **Upper atmosphere and space exploration with artificial satellites.** *National Institute of Sciences of India, Proceedings, Part A*, 26(3):215–232, May 26, **1960.** 10 figs., 5 tables, 24 refs. **DWB**—A summary and explanation of facts and theories related to upper atmosphere and space exploration with artificial satellites. The subjects considered are: density and temperature distribution in the upper atmosphere, ionosphere, both the Faraday fading effect and Doppler effect, the Van Allen corpuscular radiation belts, cosmic ray observations, and outer atmosphere extension. Concluding remarks deal with India's participation in the Space Research Programme. Though funds are limited, research scientists are encouraged to undertake theoretical work on ill understood features of space and outer atmosphere. *Subject Headings:* **1. Satellite observations 2. Upper atmosphere research 3. Space research.**—*E.Z.S.* Ⓢ

12F–66 551.510.53:551.510.41

†Nagy, A. F., **Measurements of atmospheric pressure, temperature, density and composition at very high altitudes.** Michigan. Univ. Research Institute, Contract DA-36-039-sc-78131, Report No. GQ-6, Feb. 1, 1960–July 1, **1960.** 19 p. 7 figs. (incl. photos), table, 26 refs., 8 eqs. **DWB** (M(051) M624qu)—This is the sixth report in a series which outlines a research effort whose object is the determination of the ambient pressure, temperature, density and composition of the earth's atmosphere at altitudes where the mean free path of the neutral particles is appreciably greater than the dimensions of the measuring object. An investigation directed toward the determination of the optimum orifice size with reference to the main spherical body and its motion is included in the appendix. *Subject Headings:* **1. Upper atmosphere research 2. Upper atmosphere composition.**—*E.K.* Ⓢ

12F–67 551.510.536:551.507.362.2

†Nicolet, Marcel, **Structure of the thermosphere.** *Planetary and Space Science*, 5(1):1–32, Jan. **1961.** 16 figs., 3 tables, 87 refs., numerous eqs. **DWB.** Also issued as: Pennsylvania. State Univ. Ionosphere Research Lab., Contract AF 19(604)-4563, Scientific Report No. 134, July 1, **1960.** 78 p. 18 figs., table, refs. p. 73–78, 76 eqs. **DWB**—Mean values and variations of the density, construction of the thermosphere, effects of solar radiation, heat conduction, and comparison of thermospheric conditions with atmospheric models are discussed. It has been concluded that the vertical distribution of the density of the high atmosphere deduced from satellite observations can be explained if the atmosphere in which the various constituents are subject to diffusion is isothermal above a certain level; the altitude of the thermopause and the temperature of the isothermal atmosphere vary considerably between night and day; the normal heating of the upper atmosphere takes place by electric radiation; the density of the high atmosphere is essentially dependent on the solar energy absorbed below 200 km. *Subject Headings:* **1. Upper atmosphere structure 2. Thermosphere 3. Satellite observations.** —*E.K.* Ⓢ

12F–68 551.507.362.2:551.510.3:551.510.53

Parkyn, D. G. (*Dept. of Math., Univ. of Cape Town, S. Africa*), **Satellite orbits in an oblate atmosphere.** *Journal of Geophysical Research*, Wash., D. C., 65(1):9–17, Jan. **1960.** 5 figs., 13 refs., 22 eqs. **DWB, DLC**—Density values of the upper atmosphere derived from the rate of development of the orbits of earth satellites suffer from errors introduced by uncertainties in the determination of the mean drag cross section. As a result it is difficult or impossible to detect minor variations in the density such as, for example, its latitude dependence. An analysis is developed which circumvents this difficulty by considering the behavior of a dynamically simple parameter—the square of the product of the semimajor axis and the eccentricity. Examples from published orbital data are discussed, showing clearly the presence of a latitude dependence, and estimates of the ratio of polar to equatorial density are deduced. *Subject Headings:* **1. Satellite orbits 2. Upper atmosphere density measurement techniques.**—*Author's abstract.* Ⓢ

12F–69 551.510.53:551.506.7:551.507.362.2

Philipps, Horst, **Bestimmung der Dichte in der hohen Atmosphäre mittels Beobachtungen an künstlichen Erdsatelliten.** [Determination of the thickness of the upper atmosphere from observation of artificial satellites.] *Germany. Deutsche Demokratische Republik. Meteorologischer und Hydrologischer Dienst, Abhandlungen*, 8(55), **1960.** 48 p. 2 figs., 6 tables, 13 refs., 100 eqs. Russian and English summaries p. 47–48. **DWB, DLC**—The establishment of equations to express the atmospheric resistance, which affects the satellite movements are discussed. These formulae allow a presentation of the variations of the orbital elements. The results of theoretical studies are applied

to the mean values of observations made by four satellites and the temperature distributions obtained agree with the ARDC-model and with the model developed by WHITNEY. Density values were found to be between 3, 4.10^{-12} and 3, 8.10^{-13} gc^{-3} at 216 km and between 4, 8.10^{-16} and 3, 3.10^{-14} gc^{-3} at 567 km. The computed density distributions show a fairly good agreement with the two recent 1957 SMITHONIAN models. *Subject Headings:* **1. Upper atmosphere density data 2. Satellite observations.**—*E.K.* Ⓢ

12F–70 551.510.41:551.510.53

Pokhunkov, A. A., **Issledovanie neĭtral'nogo sostava verkhneĭ atmosphery na vysotakh svyshe 100 km.** [Investigation of the neutral composition of the upper atmosphere at heights greater than 100 km.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 11:1649–1657, Nov. **1960.** 10 figs., 17 refs. Russian summary p. 1649. **DLC**—In investigating such important problems of geophysics as gravitational separation and dissipation of gases in the earth's atmosphere, it is important to study the neutral composition and its changes with height. The existence and the level of gravitational separation is obtained from the study of changes in relative composition of gases with height, the mean molecular weight of air and atmospheric density. The data thus obtained can be used for constructing a model of mean standard atmosphere of the Earth up to the heights of 300 to 500 km, depending on the sensitivity of the instruments. Development of the rocket technique is mentioned. Work in this field has been in progress since 1952 in the U. S. and since 1957 in the U.S.S.R. The basic characteristics of the mass spectrometer are described. Samples of records are given. Results of observations are discussed and explained. *Subject Headings:* **1. Upper atmosphere composition 2. Upper atmosphere densities 3. Rocket measurement techniques.**—*B. J. Gavrisheff.*

12F–71 551.510.3:551.510.53:551.507.362

†Poloskov, S. M.; Pukhunkov, A. A. and Danilov, A. D. (*Acad. Sciences, Moscow, U.S.S.R.*), **Upper atmosphere structure parameters according to data obtained from USSR rockets and satellites during IGY.** *International Space Science Symposium, Nice, Jan. 1960, Space Research: proceedings of the First Symposium.* Pub. **1960.** p. 95–116. 14 figs., 3 tables, 33 refs., 7 eqs. Russian summary p. 95. **DWB** (523.1 161sp)—Properties of the upper atmosphere have been investigated by means of rockets and satellites. Densities have been determined at altitudes from 100–500 km. The presence of neutral particles at altitudes between 100, 200 and 300 km has been observed. The gases are identified as H, H_2, N, O, OH, H_2O, O_2, Ar and CO_2. Positive ions of O^+, N^+, N_2^+, NO^+ and O_2^+ have been recorded at altitudes from 230–1000 km. From theoretical and experimental studies, the possible variation of molecular nitrogen has been calculated for altitudes between 100 and 400 km. *Subject Headings:* **1. Upper atmosphere properties 2. Upper atmosphere densities 3. Soviet rockets 4. Soviet satellites 5. IGY program.**—*Authors' abstract.* Ⓢ

12F–72 551.507.362.2:551.510.535:551.510.535.4

Priester, W.; Martin, H. A. and Kramp, K. (*all, Sternwarte, Bonn Univ.*), **Diurnal and seasonal density variations in the upper atmosphere.** *Nature*, London, 188(4746):202–204, Oct. 15, **1960.** 4 figs., 7 refs. **DWB**—Diurnal and seasonal density variations at altitudes of 210, 562 and 660 km derived from the variations in the acceleration of the Sputnik 3, Vanguard 1 and Vanguard 2 are illustrated graphically. All diurnal variation curves have similar shapes with a peak density at about 2 p.m. true local time, a steep decline to sunset and a slower decline through the night with a sharp rise after sunrise. The amplitude of variation increases with altitude. The diurnal variation results from the absorption of ultraviolet radiation and from heat conduction. The physical condition in the upper atmosphere may be summarized by the following simplified picture: The "solar effect" originates in the F1 layer as a result of heating by the solar He + line at 304 Å. This explains the good correlation between density variations above 200 km and solar decimeter radiation (3–30 cm). The period of the density variations agrees largely with the rotational period of the sun. The heating of the F1 layer determines the boundary conditions for the upper atmosphere at 210 km. The diurnal variation of density at 210 km is only a few percent. Absorption of solar electromagnetic radiation in the F2 layer together with the large heat conductivity causes the intense diurnal density and temperature variations above 300 km. *Subject Headings:* **1. Ionosphere 2. Upper air density 3. Upper air temperature 4. Satellite observations.**—*R.B.* Ⓢ

12F–73 551.507.362.2:551.510.536:546.21:537.563

Singer, S. F., **Structure of the earth's exosphere.** Maryland. Univ. Dept. of Physics, Contract AF 19(604)-3861, [Unnumbered Report]. **1960.** 8 p. fig., 10 refs.—The main components of the Earth's exosphere are neutral oxygen, neutral hydrogen atoms, ionized oxygen, and ionized hydrogen. The position of the base of the exosphere is established at an altitude of 530 km from an analysis of density data obtained from satellite drag observations. The relative distribution of both neutral oxygen and neutral hydrogen is derived from a theory of the exosphere. The normalization of

oxygen is accomplished by means of satellite drag data. The normalization of hydrogen is accomplished by the use of the Lyman-alpha technique of JOHNSON, FRIEDMAN and TOUSEY. The distribution of ionized oxygen can be established jointly from the rocket measurements of BERNING and from an analysis of radiation belt data obtained from satellites. They give a consistent picture of ionized oxygen becoming the most important constituent of the atmosphere at about 1500 km. The distribution of ionized hydrogen is only imperfectly known at the present time. (*Same item as* 11J–157, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Exosphere 2. Upper atmosphere density measurements 3. Satellite data.**—*Author's abstract.*

12F–74 551.510.536:551.521.64

Singer, S. F. (*Physics Dept., Univ. of Md., College Park, Md.*), **Properties of the upper atmosphere and their relation to the radiation belts of the earth.** *Planetary and Space Science*, N. Y., 2(2/3):165–173, April **1960.** 6 figs., 16 refs., 3 eqs. **DWB**—This paper describes a new theory which gives the distribution of density with altitude for a planetary exosphere in the absence of thermodynamic equilibrium. The new method takes into consideration the statistical distribution of particle orbits issuing from the base of the exosphere and integrating their contribution to the density of each level. The application of this method is discussed and illustrated in detail. The results from this method are reported to differ considerably from those calculated on the basis of a hydrostatic equation. *Subject Headings:* **1. Exosphere 2. Density gradient in upper atmosphere 3. Van Allen belts.**—*From author's abstract.* Ⓢ

12F–75 551.510.535/6:551.507.362

†Kallmann-Bijl, H. K. (*Univ. Calif.*), **Daytime and nighttime atmospheric properties derived from rocket and satellite observations.** *Journal of Geophysical Research*, Wash., D. C., 66(3):787–795, March **1961.** 7 figs., 2 tables, 34 refs., 2 eqs. **DLC**—Upper air densities obtained by means of rockets and satellites in the region from 100 to about 800 km are presented. Variations of densities from day to night become apparent around 200 ±30 km; the effect increases with altitude. Pressures and scale heights are derived from densities, and preliminary mean, and daytime and nighttime values are obtained. From the variation of scale height with altitude, regions of constant temperature and of variable molecular weight have been determined. It has been found that the mean temperature at about 300 km is approximately 1400°K and that it stays constant above that altitude. Two hours after noon, at about 350 km, the temperature rises to approximately 1800°K. Shortly after midnight, the temperature drops to about 1050°K and stays approximately constant above 250 km. A change in slope of the density curve in the ionosphere is indicated from satellite observations. It is shown that, as a result of this, the scale height in the F and E regions has a pattern comparable to the electron density pattern in these regions. The possibility of a solar activity effect on densities is discussed. *Subject Headings:* **1. Upper atmosphere density data 2. Upper air temperature variations 3. Solar effects 4. Rocket observations 5. Satellite observations.**—*Author's abstract.* Ⓢ

SUPPLEMENTARY MATERIAL

1948

12F–76 551.510.53:551.593.55

Megrelishvili, T. G. and Khvostikov, I. A., **Stoenie vysokikh sloev atmosfery po sumerechnym nabliudeniiam.** [Structure of upper layers of the atmosphere from twilight observations.] *Akademiia Nauk SSSR, Doklady*, 59(7):1283–1286, March **1948.** 3 figs., 12 refs., eq. **DLC**—In order to verify the reliability of the twilight method and to determine its role and place among the other methods of investigating the upper atmospheric layers, the authors have carried on systematic photoelectric evaluations of twilight sky brightness at the Astrophysical Observatory of Abastuman (Caucasus), since 1942; and compared the mean values of air density and pressure at high altitudes obtained from 250 twilight observations during the period cited—with results achieved by using other methods of investigation at various heights, as L. W. WHIPPLE (meteoric observations), L. HARANG (brightness of auroras), K. G. BADDEN, J. A. RATCLIFFE and M. V. WILKES (reflection of radio waves), E. V. APPLETON and others. Authors show that at least to a height of 180 km (and possibly to 280 km) the results obtained by the twilight method are fully confirmed by the other methods and the picture of the upper atmosphere structure obtained on basis of all indirect methods has been confirmed by recent measurements made with aid of V-2 rockets. The working up of twilight observations does not take into consideration second degree scattering of light. HULBURT'S deductions on the disastrous effect of secondary scattering of light over 10 km are refuted by the simple coincidence of twilight data with all other data. *Subject Headings:* **1. Upper atmosphere structure 2. Twilight observations.**—*A.M.P.*

1950–1954

12F–77 551.524.7:551.593.5

Shtaude, N. M., **Popytka opredeleniia temperatury verkhnikh sloev zemnoĭ atmosfery po nabliudeniiam iarkosti sumerechnoĭ dugi.** [Attempt to determine the temperature of the upper layers of the earth's atmosphere from observations of the brightness of the twilight arc.] *Akademiia Nauk SSSR, Doklady*, 74(4):703–705, **1950.** 4 figs., 4 refs. **DLC**—Observations were carried out during Feb. March 1948 at Alma Ata with two phototubes, using regular photoplates. One of the tubes was directed toward the zenith, the other toward the setting sun 20° above the horizon. Figures present the data obtained from three simultaneous measurements up to 110 km. The author estimates the corrections in the temperature measurements by the twilight method due to the effect of second or higher order scattering and atmospheric transparency on the corpuscular brightness. He finds that the corrections may be considerable; but near the maximum of the curve of brightness of primary scattering the effect of secondary scattering is small. The atmospheric transparency has the effect of shifting the position of the maximum slightly; but, for each region of the spectrum, a point of the sky can be selected at which the correction becomes negligible. *Subject Headings:* **1. Upper air temperatures 2. Twilight observations 3. Scattering of light.**—*E.K.*

12F–78 551.521.1:551.510.534 523.74:550.38:551.590.2

Adel, Arthur (*Arizona State College, Flagstaff*), **The solar-terrestrial parameter "Effective radiation temperature of the ozone region" and evidence for solar variability with a period of ten weeks.** *American Meteorological Society, Bulletin*, 35(8):376–377, Oct. **1954.** 5 refs. **DWB**—Evidence is presented to show the existence of a solar-terrestrial relationship involving the effective radiation temperature of the ozone region. It includes the existence of a good correlation between abrupt changes in the effective radiation temperature of the ozone region (ERTOR) and coronal and disk excitation of the sun and the fact that the annual trend of ERTOR depends upon solar radiation since its maximum and minimum keep step with the summer and winter, respectively. (*Same item as* 6.5–141, May 1955, *Met. Abs.*) *Subject Headings:* **1. Solar-terrestrial relationships 2. Effective radiation 3. Ozonosphere temperatures 4. Ozone layer.**—*I.L.D.*

1955–1957

12F–79 551.510.3:551.510.53:551.508.762

Ashburn, Edward V. and LaMarca, L. G., **Measurement of the atmospheric density distribution by the searchlight technique.** *Journal of Geophysical Research*, Wash., D. C., 60(3):361–362, Sept. **1955.** fig., 3 eqs., 4 refs. Also: Elterman, Louis, **Reply to comments by Ashburn and LaMarca,** *Ibid.*, p. 363. **DLC**—L. Elterman published results of determination of atmospheric densities through an analysis of measurements of the light scattered from a searchlight beam. (*See* 12D–108, and 12D–135, *Met. Abs.*) The theoretical analysis he presented differed from that developed by the authors. Since the effect of these differing analyses upon the final results is so large it appears worthwhile to submit a new one for comparison with that given by Elterman. Formulas are derived and an illustrative diagram included. In his reply, Elterman defends his analysis. *Subject Headings:* **1. Upper atmosphere density distribution 2. Searchlight techniques.**—*A.J.M.*

12F–80 551.510.5:551.524.7:551.543.1

*Sawada, R. (*Central Met. Obs., Tokyo*), **The atmospheric lunar tides and the temperature profile in the upper atmosphere.** *Geophysical Magazine*, Tokyo, 27(2):213–236, March **1956.** 15 figs., 5 tables, 11 refs., 7 eqs. **DWB, DLC**—The atmospheric lunar tides for temperature profiles which have rather cool ozonospheres (262–271°K) are discussed and are shown to give more satisfactory tides than that of rather warm ozonosphere which was computed in the previous paper (1954). The dependence of the surface pressure oscillation to the temperature of the top atmospheric layer is established. Surface wind components are also computed to show the sensitive dependence of the phase angle to the ozonospheric temperature. Vertical structure of tides is also presented to show that the most sensitive changes in the phase angles of tides occur in the lowest atmosphere below 25 km, above which practically no dependence to the temperature of the ozonosphere is shown as far as the phase angles are concerned, while this is not the case for the amplitudes. Summarizing these results it is concluded that the real temperature profile in the upper atmosphere may be near by profile no. 31 which has the maximum temperature of 262.33°K in the ozonosphere. (*Same item as* 8.3–142, March 1957, *Met. Abs.*) *Subject Headings:* **1. Temperature profiles 2. Lunar atmospheric tides 3. Ozonosphere 4. Upper atmosphere research.**—*Author's abstract.*

1958

12F–81 551.510:551.510.41

Gauroy, P., **L'océan aérien.** [The air ocean.] *Geographia*, Paris, No. 85:21–28, Oct. **1958.** 7 figs., 11 refs. **DLC**—General survey of the structure and composition of the terrestrial atmosphere,

the troposphere, stratosphere and ionosphere. Concise statement of the processes and means used for studying the various regions of the upper atmosphere is given. *Subject Headings:* **1. Atmospheric composition 2. Atmospheric structure.**—*A.V.*

12F–82 551.506.7:551.507.362.2

*Petri, Winfried (*Schliersee, Obs.*), **Auf der Schwelle des Weltraums: bericht über die ersten Wochen der künstlichen Erdsatelliten (Sputniki) 1957α_1, α_2 und β.** [At the threshold of outer space: Report on the first week of artificial earth satellites (Sputniks) 1957α_1, α_2 and β.] *Naturwissenschaftliche Rundschau*, Stuttgart, 11(1):1–7, Jan. **1958.** 7 figs., 5 tables, eqs. **DWB, DLC**—The author summarizes Soviet studies on experimental rockets appearing in the Soviet literature prior to the launching of Sputnik I and II, including description of the structure of the rockets, indication of satellite launching and various information on the instrumentation for obtaining data on outer space and on the duration of the recording and transmission time. This is followed by a discussion of the celestial mechanics of satellites close to the earth, the influence of gravity upon the satellite path, the effect of precession upon the rotation of the plane of the path, the rotation of the opsidal lines, the braking action of atmospheric density upon the path, etc.; the visual observation methods employed to track the satellite, namely: "moonwatch"; various problems in determining the time of revolution of the satellite by visual means; reception of signals from the satellite radio by "Minitrack"; the radio interferometer technique; evaluation of the radio signals and lunar echoes from the Sputnik. Diagrams showing the motion of Sputnik within 24 hrs, a comparison of the paths of the first two satellites, and graphs showing the variation of atmospheric pressure with altitude according to Soviet data, U. S. data and the standard atmosphere, satellite path at 530 km, variation of reception frequency as a function of time, and variation in the revolution period of satellite α_2 and numerical data on the first two satellites. (*Same item as* 11J–133, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Satellite observational data 2. Soviet satellite, 1957 Alpha (Sputnik I) 3. Soviet satellite, 1957 Beta (Sputnik II).**—*I.L.D.*

1959

12F–83 525.2:551.5:550.3:551.46:551.510.536

Chapman, Sydney, **The earth and its environment.** *Institute of Radio Engineers, N. Y., Proceedings*, 47(2):137–141, Feb. **1959. DLC**—The IGY observations of the earth were related to all its parts: core, crust, oceans, and atmosphere. The sun, the dominant feature in the earth's environment, has been observed more fully and with greater continuity than ever before. The moon's position in the sky has been intensively measured for geodetic reasons. Meteors, observed both visually and by radio, will tell us much about the upper atmosphere. The satellites have revealed new features of the region above the F layer. The sun's atmosphere envelops the earth and is extremely hot. The heat conducted from it warms the earth's outermost atmosphere and helps to extend it, perhaps to half the distance to the moon. (*Same item as* 11.10–14, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. IGY program 2. Exosphere.**—*Author's abstract.* Ⓢ

12F–84 551.506.22:551.507.362.2:551.527.7:551.510.3:523.42/3

†Jastrow, Robert (*NASA, Wash., D. C.*), **Outer atmospheres of the earth and planets.** *Journal of Geophysical Research*, Wash., D. C., 64(11):1789–1798, Nov. **1959.** 7 figs., 29 refs., 2 eqs. **DLC.** Condensed version in *American Geophysical Union, Transactions*, 41(1):91–94, March **1960.** 5 figs. **DLC**—The first paragraph briefly summarizes the salient facts about the outer atmosphere of Mars and Venus. This is followed by a survey of the lunar atmosphere. Here the author refers to recent calculations, which show the lunar atmosphere seriously reduced by the effects of the solar wind. The measurement of temperature and density in the terrestrial atmosphere was one of the most interesting results of the IGY upper atmosphere program. The density of the atmosphere was determined from satellite tracking data, and also by rockets. The temperature can be determined indirectly from the altitude dependence of the density measurements. Further, the disagreement of rocket and satellite results, the effect of the Van Allen belts, atmospheric models and the origin of the aurora are discussed. (*Same item as* 11J–79, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Planetary atmospheres 2. IGY research 3. Upper atmosphere density measurements 4. Upper air temperature measurements 5. Satellite tracking.**—*E.K.* Ⓢ

1960

12F–85 551.501.9:551.509:551.507.362.1

aufm Kampe, H. J. (*U. S. Army Sig. Res., Fort Monmouth, N. J.*), **Meteorological rocket network for measuring atmospheric parameters up to 250,000.** *Weatherwise*, Boston, 13(5):192–195, Oct. **1960.** 7 figs., ref. **DWB**—An account is given of the meteorological rocket network established by the U. S. Signal Corps with the cooperation of Air Weather Service and Weather Bureau. The network stations are situated at different places on the North American continent. The main

aim of the network is to obtain synoptic upper air data and investigate special features of dynamic and thermodynamics of the layer between 100-200 thousand ft. (*Same item as* 12.6-72, June 196 *Met. Abs.*) *Subject Headings:* **1. Meteorological network 2. Rockets.**—*A.H.K.* Ⓢ

12F-86 551.510.3:551.511.

Boliunova, A. D., **K voprosu o postroenii modeli atmosfery.** [Construction of an atmospher model.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 10:1529-1533, Oct. **1960.** 10 figs 4 refs. Russian summary p. 1529. **DWB, DLC.** Transl. into English in the corresponding numbe of its *Bulletin of the Academy of Sciences, USSR, Geophysics Series.* **DLC**—New data on physica characteristics of upper atmosphere were recently obtained by artificial satellites. The data, ol served by various investigators are reviewed and partially correlated with structural parameters c upper atmosphere. Actual temperature distribution is related to changing molecular weigh density and thermal conductivity with altitudes. Partial dispersion of parameters is related als to different solar activities and to different periods of the investigation. The discussion is supple mented with graphic illustrations (curves). *Subject Headings:* **1. Atmospheric models 2. Satelli data.**—*N.P.S.* Ⓢ

12E-87 551.510.3:551.510.53:551.507.362.

Izsak, Imre G. (*Smithsonian Astrophysical Obs., Cambridge, Mass.*), **Periodic drag perturbation of artificial satellites.** *Astronomical Journal*, New Haven, Conn., 65(6):355-357, Aug. **1960.** 2 figs 4 refs., 11 eqs. **DLC**—This paper presents an investigation of the short-periodic drag perturbation of artificial satellites. The essence of the method is a development into Fourier series of the righ sides of the differential equations for the elements a, e, ω, and M. The mean density distributio in the atmosphere is approximated by $\rho = 10^{-1.35}(h-55)^{-5}$. Apart from secular terms in the element a, e, and M the first-order perturbations appear in the form of Fourier series. The computatio of the perturbations has been programmed for the IBM 704. *Subject Headings:* **1. Satellite dra 2. Upper atmosphere densities.**—*Authors' abstract.* Ⓢ

12E-88 551.510.3:551.510.53:551.506.7:551.507.362.

Paetzold, H. K. and Zschörner, H. (*both, Tech. Hochschule, Munich*), **Bearings of Sputnik II and the variable acceleration of satellites.** *International Space Symposium, Nice, Jan. 1960, Spac Research: proceedings of the First Symposium.* Pub. **1960.** p. 24-36. 8 figs., 18 refs., 3 eqs. Rus sian summary p. 24. **DWB** (523.1 161sp)—Since its launching, Sputnik III was tracked with modern direction finder. From these observations information was obtained above the maximu of the F2 layer about the wave propagation of the 20 MHz frequency. The acceleration of th satellite shows marked and complicated fluctuations. From this analysis, combined with the ob served variations of Explorer I and IV, and Vanguard I, different effects on air density can be dis tinguished. 1) Day-night variation: Its amplitude strongly increases with altitude. At 220, 36 and 655 km, the factors are 1.07, 2.0 and 6.0, respectively. 2) A solar influence is shown by th close correlation between monthly fluctuation of the sunspot number and the solar radio emissio at 1500 MHz. 3) A third effect, quite different from 1) and 2), shows a quasi-annual period, whic is located primarily above 300 km altitude. One explanation might be the presence of an interstella wind, which could be caused by the peculiar motion of the sun. *Subject Headings:* **1. Satellit tracking 2. Upper atmosphere densities 3. U. S. Satellites 4. Soviet Satellite 1958 Delta (Sput nik III).**—*Author's abstract.* Ⓢ

12F-89 551.507.362.1:551.506.

†Shvidkovskiĭ, E. G., **Raketnye meteorologicheskie izmereniia.** [Meteorological measurement by rockets.] *Moscow. Tsentral'naia Aerologicheskaia Observatoriia, Trudy*, No. 29:5-50, 1960 20 figs., 50 refs., 90 eqs. **DWB**—In the present article, the atmosphere is considered to be compose of three layers: 1) lower layer or troposphere; 2) high layer (stratosphere and ionosphere) and 3 upper layer, which includes the regions of high auroras and of escape of atmospheric gases. In suc a classification the boundary between high and upper layers is conditional and is not determined b changes in the course of some important atmospheric processes. The term "high layer" is used i order to distinguish from the troposphere these regions which are included in the field of atmospheri physics. The interest in high layers is created by the existence of such important problems as th relation of high layers to troposphere in regard to general atmospheric circulation and the weathe formation; mechanics of elementary processes of radiation and the formation of macroscopic stat of the atmosphere; fundamental composition and spectrum of extraterrestrial radiation. Th history of investigations of high layers is briefly outlined. The effect of rocket development on th methods of study is discussed. Three types of high layer investigations are described: a) rocke sounding; b) artificial satellites and c) cosmic rockets. Detailed description of the U. S. rocke "Acrobee-hi" is given, illustrated with sketches and photos. The Soviet meteorological rocket i

also described and illustrated together with sketches and a record sample of the telemetric system. Techniques of "Rockoon" and "Deacon" systems are discussed. Finally, the measurements in the high layers and their mathematical foundations are considered. *Subject Headings:* **1. Atmospheric nomenclature 2. Meteorological rockets 3. Rocket exploration of the upper atmosphere.**—*B. J. Gavrisheff.* Ⓢ

12F–90 551.510.535:551.594.12:551.507.362.1

Whipple, E. C., Jr. (*Goddard Space Flight Center*), **Direct measurements of ion density and conductivity in the D-region.** *U. S. National Aeronautics and Space Administration, Technical Note* D-567, Oct. **1960.** 7 p. 4 figs., 7 refs. **DWB, DLC**—In principle, the electrical properties of the D region can be measured by direct measurement techniques now used in the lower atmosphere (below about 30 km). The sounding rocket carries the instrumentation. This paper describes an ion collector experiment adapted for rocket determination of ion density and conductivity in the D region (up to about 80 km). Results obtained when this experimental collector was flown in the Viking-5 rocket are discussed; and the importance of dust in providing a recombination surface for ions and electrons is considered for two areas: the D region and interplanetary space. *Subject Headings:* **1. Ion density in D layer 2. Rocket measurement techniques 3. Viking rockets.**—*Author's abstract.* Ⓢ

1961

12F–91 551.524.7:551.507.361.1

Baynton, H. W. (*Bendix Corporation*), **Rocketsonde temperature profiles over White Sands, New Mexico.** *American Meteorological Society, Bulletin*, 42(1):11–16, Jan. **1961.** 8 figs., 2 tables, 5 refs. **DWB, DLC**—Rocketsondes were used to obtain temperature profiles up to heights of 128,000 ft over White Sands Proving Ground. A thermistor mounted in a duct internal to the rocketsonde yielded a profile warmer than a concurrent radiosonde but in good agreement with an acoustic profile proposed by REED. When an external duct was used, the rocketsonde profile conformed to the radiosonde and ICAO standards up to 110,000 ft, but above this height the inversion intensified abruptly and the profile was rapidly approaching the acoustic profile at the top of the flight. It is suggested that the reconciliation between acoustic profiles and the ICAO standards may be found in a relatively thin layer in which the ozonospheric inversion intensifies. *Subject Headings:* **1. Upper air temperature measurement techniques 2. Rocketsondes 3. Temperature profiles 3. White Sands, N. M.**—*Author's abstract.* Ⓢ

12F–92 551.510.724:551.524.7:551.547

Ney, Edward P.; Maas, Raymond W. and Huch, William F. (*all, Univ. Minn.*), **The measurement of atmospheric temperature.** *Journal of Meteorology*, Boston, 18(1):60–80, Feb. **1961.** 17 figs., 2 tables, 5 refs., 8 eqs. **DWB, DLC**—The theory of air temperature measurement at pressures between 100 mb and 1 mb is discussed on the basis of the classical approach to heat transfer problems. The theory so developed has been checked by measurements on ventilated and unventilated thermometers in a bell jar in which the pressure can be varied over the range of interest. The bell jar experiments support the theory and indicate the way in which temperature measurement errors may be evaluated under all possible conditions for thermometers in the atmosphere. Finally, a series of flight tests with thermometers of new design, as well as the conventional thermistors, verifies the prediction concerning thermometer errors and indicates the type of thermometer necessary in order to minimize these errors. The flight tests show, in addition to verifying the predictions concerning radiation and time constant errors, that boundary layers from the balloon, equipment and associated lines may introduce errors at least as great as the systematic errors in the temperature measurement. The flight tests also show the configurations required in order to minimize the errors due to the warming or cooling of the air by the equipment and by the balloon. *Subject Headings:* **1. Upper air temperature measurement techniques 2. Upper air measurements 3. Heat transfer.**—*Authors' abstract.* Ⓢ

12F–93 551.510.53:551.506.22

Nordberg, W. and Stroud, W. G. (*both, NASA Wash., D. C.*), **Results of IGY rocket-grenade experiments to measure temperatures and winds above the Island of Guam.** *Journal of Geophysical Research*, Wash., D. C., 66(2):455–464, Feb. **1961.** 7 figs., table, 10 refs. **DLC**—Temperature and wind measurements up to an altitude of 80 km resulting from 9 rocket-grenade firings during Nov. 1958 on the Island of Guam are presented and discussed. Densities and pressures were calculated from the temperature data. The temperature results agree with previous grenade measurements at White Sands, N. Mex. They show a peak temperature of approximately 270°K at 47 km. Weak westerly circulation prevails between 35 and 70 km. An abrupt reversal in wind direction from east to west between 25 and 35 km was observed. The weak westerlies sometimes are subjected to

major disturbances near the 55-km level. Toward 70 km, the westerlies generally seem to diminish *Subject Headings:* 1. **Upper atmosphere temperature measurements** 2. **Upper air wind measurements** 3. **Rocket-grenade experiments** 4. **IGY research** 5. **Guam.**—*Authors' abstract.* Ⓢ

12F–94 551.510.3:551.510.53:551.501.71

†Quiroz, Roderick S. (*Climatic Center USAF, Wash., D. C.*), **Air density profiles for the atmosphere between 30 and 80 kilometers.** *U. S. Air Weather Service, Technical Report* 150, Jan. **1961** 46 p. 2 figs., numerous charts, 2 tables, 46 refs. **DWB**—The main object of this report has been to present original density data derived from rocket, rocket grenade, rocket and falling sphere and searchlight observations. Density values have been obtained for even-kilometer levels, for 2-km separations from 30–80 km. Tentative averages and extremes for seasons and for 3 latitude groups have been obtained; these will be revised in the near future when the final data are received for several rocket soundings now regarded as provisional. The final results, along with a discussion of the latitudinal and time variation of density in the mesosphere, will be presented in a later report. All of the density values are shown in grams per cubic meter. The density profiles in the Appendix are listed chronologically. *Subject Headings:* 1. **Upper atmosphere density** 2. **Density gradient** —*E.K.* Ⓢ

12F–95 551.510.3:551.510.53(

Quiroz, Roderick S. (*Climatic Center USAF, Wash., D. C.*), **Seasonal and latitudinal variations of air density in the mesosphere (30 to 80 kilometers).** *U. S. Air Weather Service, Technical Repor* 151, March **1961.** 16 p. 4 figs., 4 tables, 14 refs. **DWB.** Also issued in *Journal of Geophysical Research,* 66(7):2129–2139, July **1961.** **DWB**—From data of 65 soundings (published in *Repor* 150, Jan. **1961**), together with data for four additional soundings, means and extremes for the entire data sample, and seasonal means and extremes for three latitude groups are presented in tables and graphs. Standard deviations were computed for every 10 km. Conclusions reached are: a) the lowest densities are found in winter in Arctic latitudes. At 65 km, the mean winter density is 60% of the mean summer density; b) the seasonal variation in mid-latitudes is relatively small, less than 5% below 50 km, with a maximum of 13% at 66 km; c) the latitudinal gradient is greatest in winter and greatest at around 65 km. The gradient is directed northward from mid-latitudes, in the amount of 2% per degree of latitude (at 65 km), and there is a smaller gradient equatorward from mid-latitudes; d) at mid-latitudes, the standard deviation of density varies from 4% (of the mean density) at 30 km to about 20% near 60 km, remaining nearly constant up to the mesosphere. In Arctic latitudes, the standard deviation varies from 11% at 30 km to a maximum about 40% near 60 km, decreasing to about 30% at 80 km. e) The observational material necessary to establish the magnitude of diurnal and interdiurnal variations in density in the mesosphere in not yet available. The conclusions are based on the best data available at the end of 1960. *Subject Headings:* 1. **Upper atmosphere density variations** 2. **Mesosphere.**—*Based on author's summary.* Ⓢ

12F–96 551.510.53:551.510.3:623.451.519

Dommett, R. L., **A quadri-exponential atmosphere suitable for use in ballistic missile studies.** *Royal Aircraft Establishment, Farnborough, Technical Note,* G. W. 547, **1960.** 36 p. fig., tables, 12 refs. **DNASA**—A quadri-exponential atmosphere consisting of four exponential density-height steps is described. This is considered to have advantages over more common standard atmospheres based on linear temperature-height relations particularly in analytic studies which relate to vehicles which transverse a considerable portion of the earth's surface. Tabulations are given for altitudes up to 300,000 ft at 1,000 ft intervals. The model is an extension of the model first proposed by Chapman and tabulated by Scott and Dommett. A more exact calculation has been made of the constants defining the atmosphere, to give a better fit at the matching points between the varying steps. *Subject Headings:* 1. **Atmospheric structure** 2. **Atmospheric models** 3. **Upper atmosphere densities.**—*From author's abstract.*

SUPPLEMENT

12F–97 551.506.7:551.508.822(78)

†*Larson, Terry J. and Washington, Harold P. (*Flight Res. Center, Edwards, Calif.*), **Summary of rawinsonde measurements of temperatures, pressure heights, and winds above 50,000 feet along a flight-test range in the southwestern United States.** *U. S. National Aeronautics and Space Administration, Technical Note* D-192, Jan. **1960.** 80 p. 11 figs., 10 refs. almost entirely data. **DWB, DLC**—Yearly, seasonal, diurnal, and 24-hour variations of temperatures, pressure heights, and winds in the 100-millibar to 2-millibar pressure range from rawinsonde data of four stations along a flight-test range in the southwestern United States are presented. This range, referred to as High Range, extends from Edwards, Calif., to Wendover, Utah, to accommodate flight operations of the X-15

and other high-performance craft. Comparisons of average temperatures and pressure heights are made with those of the U. S. Extension to the ICAO Stantard Atmosphere. *Subject Headings:* **1. Rawinsonde data 2. Upper air temperatures 3. Upper air pressure 4. Upper air winds 5. Western U. S.**—*Author's abstract.*

12F–98 551.510.535:551.510.62:551.510.536:551.510.3

Mawdsley, J. (*Dominion Physical Lab., Lower Hutt, New Zealand*), **Air density variations in the mesosphere, and the winter anomaly in ionospheric absorption.** *Journal of Geophysical Research*, Wash., D. C., 66(4):1298–1299, April **1961.** 13 refs. **DLC**—Points out the desirability of determining ionospheric absorption while measuring mesospheric air density. A simple way of monitoring ionospheric absorption is by recording the sky wave field strength of a suitable medium or high frequency transmitter. The extra absorption on some days is due to an increase in the rate of ion production or decrease in ionization loss rate or a movement of ionization from other levels. The large air density increase observed in winter at Ft. Churchill may reveal vertical air movements that bring about the much larger enhancement in nitric oxide density. Some instances are pointed out which prove the anomalous winter absorption. *Subject Headings:* **1. Upper atmosphere density variations 2. Mesosphere 3. Ionospheric absorption 4. Ft. Churchill, Canada.**—*A.H.K.*

12F–99 551.510.535/6:551.510.53

Paetzold, H. K. (*Technische Hochschule, Munich*), **Die Luftdichte in der irdischen Ionosphäre und Exosphäre.** [Atmospheric density in the terrestrial ionosphere and exosphere.] *Naturwissenschaften*, Berlin, 48(2):39–40, Jan. 15, **1961.** 2 figs., 4 refs. **DLC**—Graphs showing the distribution of atmospheric density in the exosphere (normalized to a solar radiation emission of 10 cm of 200.10^{-22} W/m^2H_z, to a daily maximum value and mean value of annual effect; normalized to a night minimum value and normalized to the minimum value of solar activity and annual effect) and atmospheric density distribution in the F layer are presented and analyzed. The value obtained by the data of Echo I has an uncertainty of $\pm 50\%$. The atmospheric density decreases more slowly in the exosphere above 1000 km. A value of 300 km is obtained for the so-called scale height $H = KT/\bar{m}g$. A temperature of 3500°K is obtained for a mean molecular weight $\bar{m}$ of 15. If an isothermal atmosphere with a temperature of 1700°K, as at 600 km, is assumed, a mean atomic weight of 7 is obtained; this indicates a large fraction of atomic hydrogen. The relative scattering of the different points on the curve for the atmospheric density in the F layer amounts to $\pm 10\%$ so that the wave character of the curve $g(h)$ is real. A secondary flat temperature minimum at 230 km in the region between the F_1 and F_2 layer is obtained. This minimum presupposes the existence of two heated layers and a thermal depression in the minimum above and below it. *Subject Headings:* **1. Upper atmosphere density 2. Ionosphere 3. Exosphere.**—*I.L.D.*

PART III. RECENT TRANSLATIONS AND ANALYTICS FROM SERIALS AND COLLECTED WORKS

Note: Material listed in these sections will not be included in the monthly indexes until abstracted.

A. TRANSLATIONS

Akademiia Nauk SSSR, Bulletin [of the] Academy of Sciences, USSR, Geophysics Series No. 9, Sept. 1960 (Transl. of its **Izvestiia, Ser. Geofizicheskaia,** No. 9, 1960, issued by the American Geophysical Union, March 1961) (*For contents of Russian editions p. 1240 below*)

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Rapoport, M. B.: **Methods of ultrasonic seismic modeling,** p. 869–872
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Savarenskiĭ, E. F. and Obukhov, G. G.: **Validity of determining the intensity of earthquakes by surface waves,** p. 894–895
Gorodenskiĭ, S. N.: **Magnetic anomalies ΔT of an arbitrary intensity,** p. 896–898
Silaeva, O. I. and Shamina, O. G.: **Absorption of ultrasonics in granites,** p. 899–903
Arkhangel'skaia, V. M.: **Dispersion of surface waves and crustal structure,** p. 904–927
Obukhov, A. M.: **Structure of the temperature and velocity fields in free convection,** p. 928–930
Laktionov, A. G.: **Distribution by height of concentration of aerosol particles and measurement of coefficients of vertical displacement in a free atmosphere,** p. 931–936
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Akademiia Nauk SSSR. Astronomicheskiĭ Sovet, Bulletin of the Stations for Optical Observation of Artificial Earth Satellites, No. 10, 1959 (This transl. of original Russian issued as **U. S. National Aeronautics and Space Administration, Technical Translation F-11,** Feb. 1961)

Grigorevskiĭ, V. M.: **Determination of the orientation of artificial earth satellites in space from photometric data,** p. 1–6
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B. ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS

Acta Geophysica Polonica, Warsaw, Vol. 8, No. 2, 1960

Czubek, J.; Dziunikowski, B.; Jurkiewicz, L.; Krzuk, J.; Niewodniczański, J. et al.: **Kompleksowe profilowanie radiometryczne kierunkowych odwiertów kopalnianych za solami potasowymi,** [Complex radiometric well-logging in directed mine boreholes in potassium salt prospecting], p. 73–93

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Teisseyre, Roman: **A dislocation model of the earthquake mechanism and the influence of discontinuity surfaces on seismic energy release,** p. 107–113

Párczewski, Władysław: **Spread of plumes of industrial smoke,** p. 114–121

Kowalczuk, Jerzy and Karaczun, Konstanty: **Wyniki pomiarów składowej poziomej pola magnetycznego, wykonanych magnetometrem QHM-243 w Obserwatoriach Magnetycznych w Świdrze, na Helu i w Tromsö w 1957 roku,** [Results of measurements of the horizontal component of the magnetic field made with QHM-243 magnetometer in the Magnetic Observatories of Świder, Hel and Tromsö in 1957], p. 122–137

Cieślik, Zbigniew: **Wystawa "Od Kopernika do sztucznej planety" w Muzeum Techniki N. O. T. w Warszawie,** [Exhibition "From Copernicus to artificial planets" at the Technological Museum of the Central Technological Organization in Warsaw], p. 138–157

Mergentaler, Jan: **Sunspots in the year 1959,** p. 158–163

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Teisseyre, Roman: **V Zebranie Ogólne Europejskiej Komisji Sejsmologicznej (Asocjacja Międzynarodowa Sejsmologii i Fizyki Wnętrza Ziemi), Alicante, 26 31 października 1959 roku,** [Conference of the All-European Seismological Commission, International Association of Seismology and Physics of the Earth's Interior, Alicante, Oct. 26–31, 1959], p. 172–173

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Teisseyre, Roman and Siemek, Tadeuz: **A method of determining the direction of surface wave approach. Application of this method to the microseismic activity at the Phu Lien Seismological Station,** p. 312–323

Fajklewicz, Zbigniew; Kordylewski, Jerzy and Kudelski, Gerard: **Zastosowanie maszyn rachunkowych systemu kart dziurkowanych Aritma do interpretacji zdjęć grawimetrycznych i magnetycznych,** [Adaptation of Aritma punched card calculating machines to gravity and magnetic data interpretation], p. 324–336

Svoboda, Karel: **Einige Forschungsergebnisse des Internationalen Geophysikalischen Jahres in der ČSR,** [Some results of research in Czechoslovakia during the IGY], p. 337–353

Jankowski, Jerzy and Królikowski, Czesław: **Bemerkungen über einige Ergebnisse der Registrierungen von Bay-Störungen auf polnischen magnetischen Stationen,** [Remarks on some results of recordings of bay disturbances at magnetic stations in Poland], p. 354–356

Nowak, S.: **Wyznaczanie czułości wahadeł poziomych podwójnych (typu Lettaua),** [Determination of the sensitivity of the horizontal double pendulum (Lettau type)], p. 357–369

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Przybyszewski, E.: **Belsk three-hour-range indices K and magnetic character figures C for April to June 1960,** p. 372

Kosibowa, S.: **Visual observations of aurorae in Poland for January to June 1960,** p. 373–374
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Kopcewicz, T.; Tomaszenko, R.; Tomczak, J. and Tokarczyk, J.: **Results of measurements of the radioactivity of air contaminants and atmospheric precipitation at the stations of the Institute of Hydrology and Meteorology, January 1–March 31, 1960,** p. 376–378
Jurkiewicz, J. and Massalska, M.: **Results of measurements of the radioactivity of air contaminants and atmospheric precipitation in Cracow for January to March 1960,** p. 379
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Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz., No. 9, Sept. 1960. (Transl. into English in its **Bulletin of the Academy of Sciences, USSR, Geophysics Ser.,** No. 9, 1960.) (*For contents of English edition see p.* 1238 *above*)

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